Cyclone for ARM® devices

USER MANUAL

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1 INTRODUCTION

The Cyclone for ARM® devices is part of P&E's line of stand-alone programming solutions.

The Cyclone for ARM devices is designed to withstand the demands of a production environment. It is a Stand-Alone Programmer (SAP) that can be operated manually or used to host automated programming. In manual SAP mode the unit is operated using buttons and/or the LCD Menu. Host-controlled SAP mode, for automated programming, is accomplished using either a command line utility, RS232 protocol, UDP protocol, or the Cyclone Automated Control DLL.

The following features help make the Cyclone for ARM devices such a versatile production programming tool:

- **Multiple ARM Cortex™-M Manufacturer Support**
  - Freescale
  - STMicroelectronics
  - Texas Instruments (TI)
  - NXP
- **Versatile Light Touch Buttons**
  - Performs Stand-Alone Programming (SAP) operations
  - Navigates LCD menu
  - Resets Cyclone for ARM devices
- **Powerful LCD Menu**
  - Executes SAP operations
  - Selects SAP image
  - Configures Cyclone for ARM devices IP settings

- Displays operation status

- **Convenient LED Display**
  - Indicates success or failure
- **Multiple Communication Interfaces**
  - Ethernet 10/100 baseT
  - USB 1.1
  - Serial Baud 115200, no parity, 8 data bits, 1 stop bit (adjustable to 57600 Baud for RS232 controlled production environment)
- **Multiple Storage Media**
  - 7 Megabytes of onboard storage. Stores data to be programmed, programming algorithms, and any necessary configuration settings.
  - CompactFlash support available with purchase of CompactFlash activation license.
- **Versatile Power Management**
  - Uses electromechanical relays to automatically cycle target power when necessary.
  - Jumper-settable power management schemes.
- **Multiple Voltage Operation**
  - Automatically detects and caters to target voltages ranging from 1.8V to 5V.
- **Multiple Target Communication Modes**
  - Supports the following communications modes:
    - 20-Pin Regular Debug Connector JTAG Mode
    - 20-Pin Regular Debug Connector SWD Mode
    - 20-Pin Mini Debug Connector JTAG Mode
    - 20-Pin Mini Debug Connector SWD Mode
    - 10-Pin Mini Debug Connector JTAG Mode
    - 10-Pin Mini Debug Connector SWD Mode

- User selectable target communication speed.

- **Multiple SAP Images**
  - Onboard Flash stores up to 8 images.
  - CompactFlash (if activated) stores more than 200 images.
  - Images for different architectures can co-exist.
- **Multiple Memory Modules In One SAP Image**
  - Supports multiple programming algorithms for internal or external memory modules such as EEPROM and Flash.
- **Automatic Serial Number Mechanism**
  - Supports serial number programming and automatic incrementing
  - Supports multiple serial number structures within each SAP Image.
- **Powerful Automated Control Package For Production Control**
  - Basic Automated Control Package (included) supports host-controlled SAP operations for one Cyclone for ARM devices. Professional and Enterprise Automated Control Packages available for purchase.
  - Multiple Cyclones for ARM devices can create a Gang Programmer using a variety of different communication interfaces.
  - Different SAP Images on different Cyclones for ARM devices can execute simultaneously.
- **Versatile Programming Software**
  - Free image creation utility, image management utility, and IP configuration utility
  - Activation license for CompactFlash support available for purchase

2 QUICK START GUIDE FOR SAP OPERATION

Stand-Alone Programming (SAP) is the most common use of the Cyclone for ARM devices. This quick start guide illustrates how easy it is to begin using the Cyclone for stand-alone programming.

You are encouraged to read this manual in its entirety for a complete description of all Cyclone for ARM devices features, many of which are beyond the scope of this quick-start guide.

Step 1. Install Software

The first step is to install the accompanying software. This will install all of the applications and drivers that can be used to configure/control the Cyclone for ARM devices.

Once the installation is complete and the PC has been rebooted you may begin to configure the Cyclone for ARM devices for SAP operation.

Step 2. Hardware Setup

a. Configure the target power management scheme

Power management is configured by setting jumpers on the side of the Cyclone unit. The corresponding settings are conveniently illustrated on the rear label of Cyclone for ARM devices. By default, the jumpers are set to switch power from the Power IN Jack to Power OUT Jack. You may wish to refer to **Section 3.13 - Target Power Management**.

b. Connect the Cyclone for ARM devices to your PC

Select the appropriate communications interface (Serial, USB or Ethernet) and connect the Cyclone for ARM devices to your PC. If you wish to use the Ethernet port you will need to configure the corresponding network settings before use, either through the LCD menu or via the software utility ConfigureIP. The Ethernet port will not function properly until this configuration is complete. You may wish to refer to **CHAPTER 8 - ETHERNET CONFIGURATION**.

c. Power up the Cyclone for ARM devices

Step 3. Create a SAP Image

A SAP image, or Stand-Alone Programming image, is a self-sufficient data object containing the Cyclone for ARM devices and target hardware setup

information, programming algorithm, programming sequence, and target data. The Cyclone for ARM devices uses these images to perform SAP operations on target devices. Follow these steps to create a SAP image:

a. Run the *Cyclone Image Creation Utility*

This utility is a GUI designed to help users create architecture/ manufacturer-specific SAP images. To run this utility:

From the “Start” menu of your PC, navigate to “All Programs” -> “P&E Cyclone for ARM devices Programmer” -> “Cyclone for ARM devices Image Creation Utility” and select this utility. The utility is shown in **Figure 2-1**. Continue with the steps below to create an image.

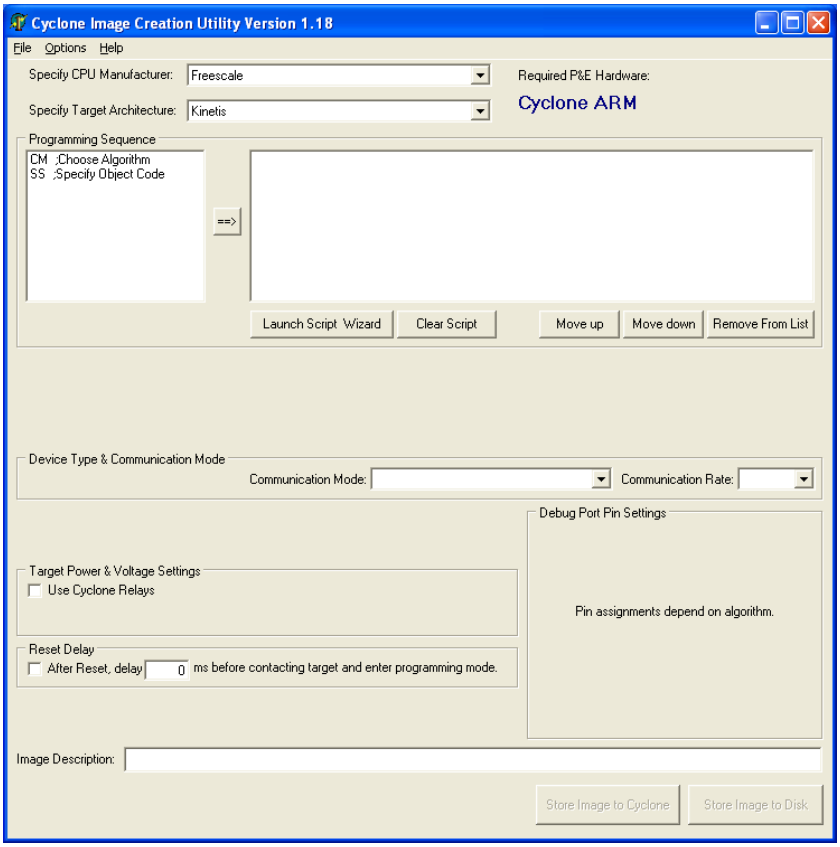

Figure 2-1: Cyclone Image Creation Utility

b. In the Cyclone Image Creation Utility, select your CPU manufacturer and architecture from their repsective drop-down lists.

c. Click the “Launch Script Wizard” button. Follow the pop-up screens to specify a programming algorithm and target object file. The programming algorithm, target object file, and default programming sequence will then show up in the programming sequence listbox.

d. Specify the auxiliary setup and hardware setup, such as Communication Mode, Communication Rate, Target Power, and Voltage Settings.

e. Type an Image Description for your SAP image. The default description is a time stamp.

f. Click the “Store Image to Cyclone” button.

g. Choose the communication interface, select the Cyclone for ARM devices to which the image will be saved, and then click the “Store Image to Cyclone” button. A backend image configuration utility will pop up and store the image information on the Cyclone for ARM devices. Your SAP image has now been created.

Step 4. Execute SAP Image

The SAP image stored on your Cyclone for ARM devices can now be executed with one button press. Once your target is connected to the Cyclone for ARM devices, press the “START” button of the Cyclone for ARM devices unit and wait for programming operations to finish. During this process, the LCD screen and LEDs will show the status of operations. Eventually the “Success” or “Error” LED will illuminate, and the LCD will display the results.

3 CYCLONE FOR ARM DEVICES HARDWARE

The following is an overview of the features and interfaces of the Cyclone for ARM devices unit. The interfaces are labeled on the underside of the Cyclone unit.

3.1 Cyclone for ARM devices Power Supply

The Cyclone for ARM devices requires a regulated 6V DC Center Positive power supply with 2.5/5.5mm female plug. The Cyclone for ARM devices derives its power from the Power Jack located on the side of the unit.

Figure 3-2: Cyclone for ARM devices Power Jack

3.2 RS232 Communication

The Cyclone for ARM devices provides a DB9 Female connector to communicate with a host computer through the RS232 communication (115200 Baud, 8 Data bits, No parity, 1 Stop bit).

Figure 3-3: Cyclone for ARM devices RS232 Connector

3.3 Ethernet Communication

The Cyclone for ARM devices provides a standard RJ45 socket to communicate with a host computer through the Ethernet Port (10/100 BaseT).

Figure 3-4: Cyclone for ARM devices Ethernet Connector

3.4 USB Communications

The Cyclone for ARM devices provides a USB connector for Universal Serial Bus communications between the Cyclone for ARM devices and the host computer. The Cyclone for ARM devices is a USB 1.1 compliant device.

Figure 3-5: Cyclone for ARM devices USB Connector

3.5 Electromechanical Relays

Inside the Cyclone for ARM devices, two electromechanical relays are used to cycle target power. The specifications of the relays are as following:

Maximum switched power:	30W or 125 VA
Maximum switched current:	1A
Maximum switched voltage:	150VDC or 300VAC
UL Rating:	1A at 30 VDC
	1A at 125 VAC

P&E only recommends switching DC voltages up to 24 Volts.

3.6 Power Connectors

The Cyclone for ARM devices provides a Target Power Supply Input Jack and a Target Power Supply Output Jack with 2.5/5.5 mm Pin Diameter. The power jacks are connected or disconnected by two electromechanical relays. When connected, the Center Pin of the Target Power Supply Input Jack is connected to the Center Pin of the Target Power Supply Output Jack. When disconnected, both terminals of the Target Power Supply Output Jack are connected to GND via a 1W, 100 Ohm resistor.

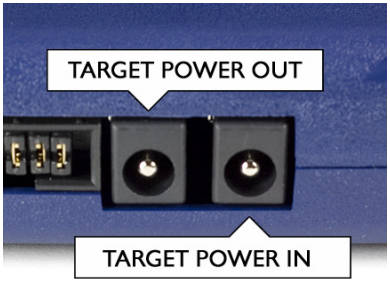

Figure 3-6: Power Connector Locations

3.7 Jumper Settings

The jumpers must be set differently for various power management options that the Cyclone for ARM devices offers. If the Cyclone for ARM devices is not being used to manage the target's power, only Jumper 5 needs to be installed. Please see **Section 3.13 - Target Power Management** for the correct jumper settings for other power management options.

3.8 Debug Connector Mechanical Drawing

The Cyclone for ARM devices provides one un-keyed standard 20-position 0.100-inch pitch dual row 0.025-inch square header, one keyed 20-position 0.050-inch pitch dual row mini header, and one keyed 10-position 0.050-inch pitch dual row mini header for ARM targets. Mechanical drawings are shown below whose dimensions are representative of the pin size and spacing of these headers (note: the number of pins depicted in the mechanical drawings may differ from the Cyclone headers).

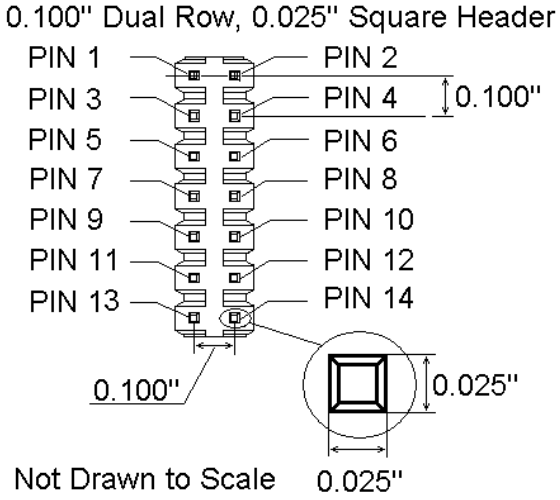

Figure 3-7: 20-Pin Un-Keyed Header Dimensions

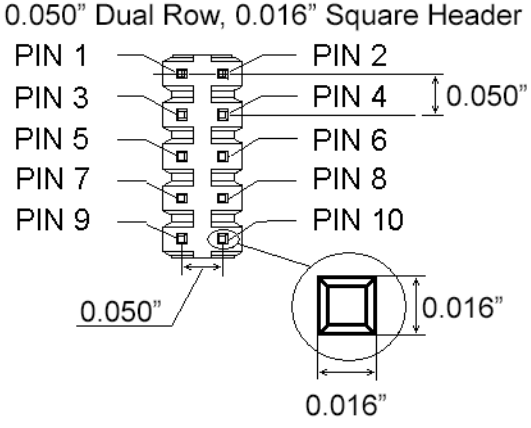

Figure 3-8: Mini 10-Pin and Mini 20-Pin Keyed Header Dimensions

3.9 20-Pin Debug Connector

The Cyclone provides a 20-pin 0.100-inch pitch double row connector for ARM targets. The 20-pin standard connector pin definitions for JTAG mode

are as follows:

20-Pin Standard Connector JTAG Mode Pin Assignments

PIN 1 -	**TVCC**	**NC** -	PIN 2
PIN 3 -	**TRST or NC**	**GND** -	PIN 4
PIN 5 -	**TDI**	**GND** -	PIN 6
PIN 7 -	**TMS**	**GND** -	PIN 8
PIN 9 -	**TCK**	**GND** -	PIN 10
PIN 11 -	**NC**	**GND** -	PIN 12
PIN 13 -	**TDO**	**GND** -	PIN 14
PIN 15 -	**RESET**	**GND** -	PIN 16
PIN 17 -	**NC**	**GND** -	PIN 18
PIN 19 -	**NC**	**GND** -	PIN 20

The Cyclone for ARM devices also supports SWD Mode. This replaces the JTAG connection with a clock and single bi-directional data pin.

20-Pin Standard Connector SWD Mode Pin Assignments

PIN 1 -	**TVCC**	**NC** -	PIN 2
PIN 3 -	**TRST or NC**	**GND** -	PIN 4
PIN 5 -	**NC**	**GND** -	PIN 6
PIN 7 -	**TMS/SWDIO**	**GND** -	PIN 8
PIN 9 -	**TCK/SWCLK**	**GND** -	PIN 10
PIN 11 -	**NC**	**GND** -	PIN 12
PIN 13 -	**NC**	**GND** -	PIN 14
PIN 15 -	**RESET**	**GND** -	PIN 16
PIN 17 -	**NC**	**GND** -	PIN 18
PIN 19 -	**NC**	**GND** -	PIN 20

SWD Mode is selected from the “Communication Mode” drop-down box in the Cyclone Image Creation Utility:

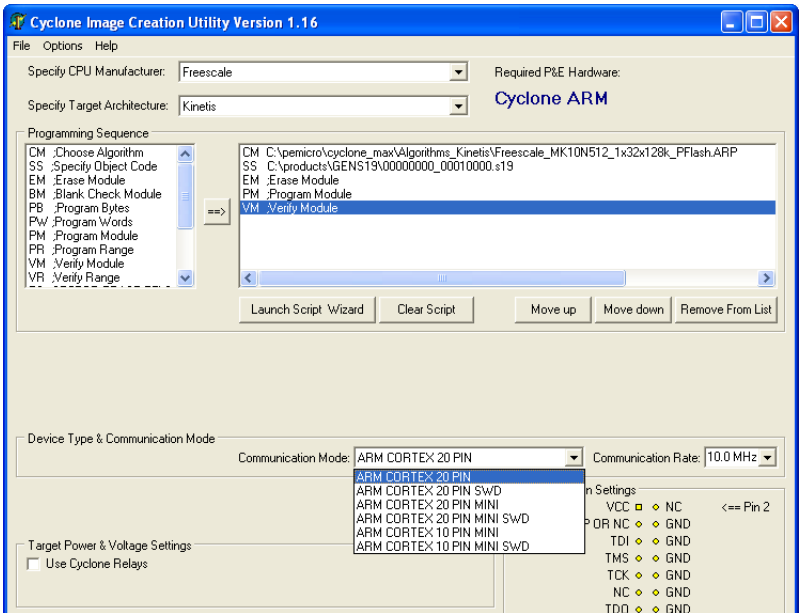

Figure 3-9: Communications Mode Selection

The location of the 20-pin standard connector is displayed below.

Figure 3-10: 20-Pin Connector

3.10 20-Pin Keyed Mini Connector

The Cyclone provides a keyed 20-pin 0.050-inch pitch double row connector for ARM targets. The 20-pin keyed mini connector pin definitions for JTAG

mode are as follows:

20-Pin Keyed Mini Connector JTAG Mode Pin Assignments

PIN 1 -	**TVCC**	**TMS** -	PIN 2
PIN 3 -	**GND**	**TCK** -	PIN 4
PIN 5 -	**GND**	**TDO** -	PIN 6
PIN 7 -	**NC**	**TDI** -	PIN 8
PIN 9 -	**GND**	**RESET** -	PIN 10
PIN 11 -	**NC**	**NC** -	PIN 12
PIN 13 -	**NC**	**NC** -	PIN 14
PIN 15 -	**GND**	**NC** -	PIN 16
PIN 17 -	**GND**	**NC** -	PIN 18
PIN 19 -	**GND**	**NC** -	PIN 20

The Cyclone for ARM also supports SWD Mode. This replaces the JTAG connection with a clock and single bi-directional data pin.

20-Pin Keyed Mini Connector SWD Mode Pin Assignments

PIN 1 -	**TVCC**	**TMS/SWDIO** -	PIN 2
PIN 3 -	**GND**	**TCK/SWCLK** -	PIN 4
PIN 5 -	**GND**	**NC** -	PIN 6
PIN 7 -	**NC**	**NC** -	PIN 8
PIN 9 -	**GND**	**RESET** -	PIN 10
PIN 11 -	**NC**	**NC** -	PIN 12
PIN 13 -	**NC**	**NC** -	PIN 14
PIN 15 -	**GND**	**NC** -	PIN 16
PIN 17 -	**GND**	**NC** -	PIN 18
PIN 19 -	**GND**	**NC** -	PIN 20

SWD Mode is selected from the “Communication Mode” drop-down box in the Cyclone Image Creation Utility:

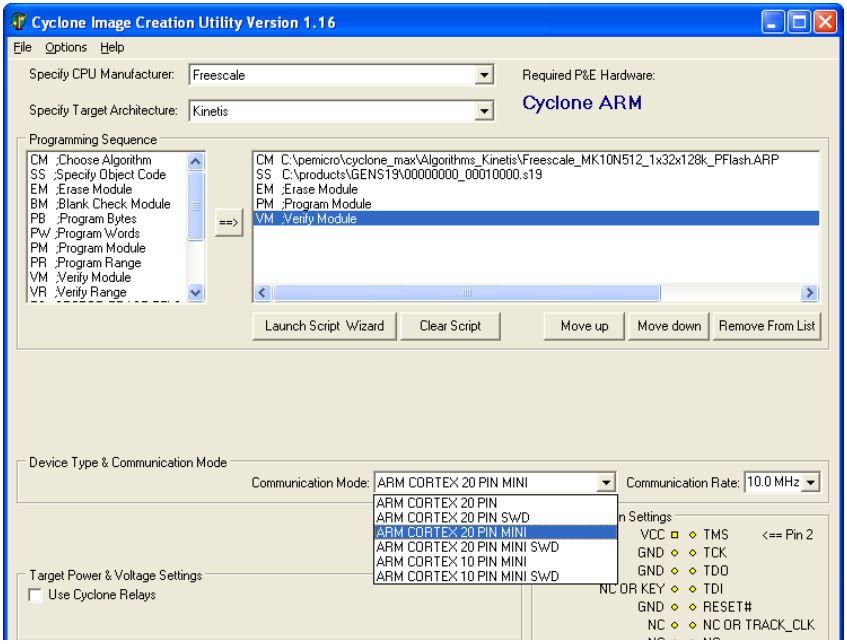

Figure 3-11: Communications Mode Selection

The location of the 20-pin keyed mini connector is displayed below.

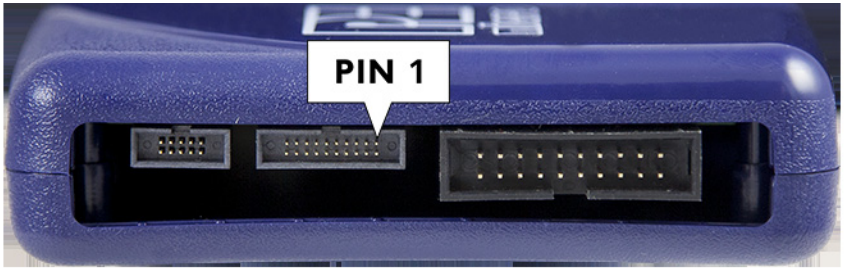

Figure 3-12: 20-Pin Keyed Mini Connector

3.11 10-Pin Keyed Mini Connector

The Cyclone provides a keyed 10-pin 0.050-inch pitch double row connector for ARM targets. The 10-pin keyed mini connector pin definitions for JTAG

mode are as follows:

10-Pin Keyed Mini Connector JTAG Mode Pin Assignments

PIN 1 -	**TVCC**	**TMS** -	PIN 2
PIN 3 -	**GND**	**TCK** -	PIN 4
PIN 5 -	**GND**	**TDO** -	PIN 6
PIN 7 -	**NC**	**TDI** -	PIN 8
PIN 9 -	**GND**	**RESET** -	PIN 10

The Cyclone for ARM also supports SWD Mode. This replaces the JTAG connection with a clock and single bi-directional data pin.

10-Pin Keyed Mini Connector SWD Mode Pin Assignments

PIN 1 -	**TVCC**	**TMS/SWDIO** -	PIN 2
PIN 3 -	**GND**	**TCK/SWCLK** -	PIN 4
PIN 5 -	**GND**	**NC** -	PIN 6
PIN 7 -	**NC**	**NC** -	PIN 8
PIN 9 -	**GND**	**RESET** -	PIN 10

SWD Mode is selected from the “Communication Mode” drop-down box in the Cyclone Image Creation Utility:

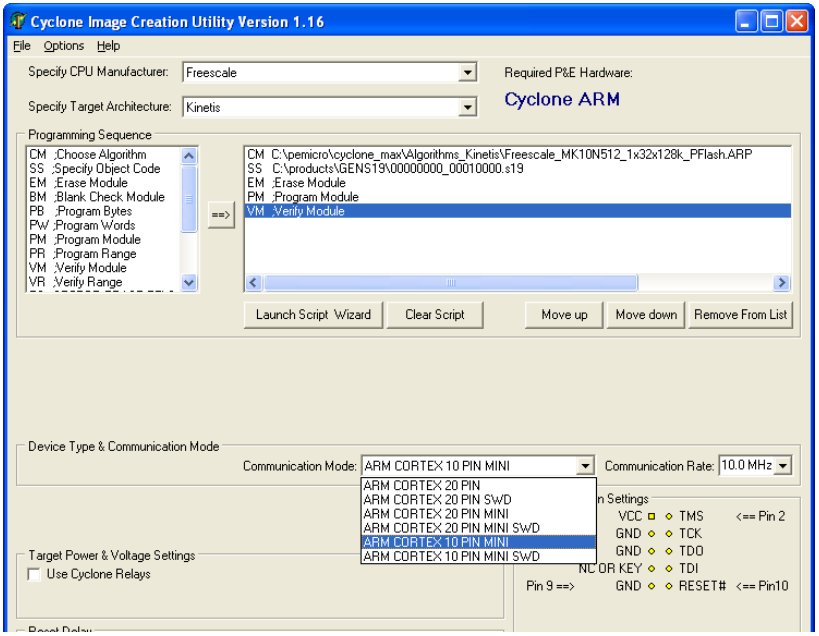

Figure 3-13: Communications Mode Selection

The location of the 10-pin keyed mini connector is displayed below.

Figure 3-14: 10-Pin Keyed Mini Connector

3.12 Ribbon Cable

The Cyclone for ARM devices communicates with the target through ribbon cables. The ribbon cable for standard 20-pin debug connectors has a 0.100-

inch centerline dual row socket IDC assembly (not keyed). The ribbon cables for 10- and 20-pin mini debug connectors have a 0.050-inch centerline dual row socket IDC assembly (keyed). The ribbon cables are designed such that the Cyclone for ARM devices Debug Connector has the same pinout as the Target Header, i.e., Pin 1 of the Cyclone for ARM devices Debug Connector is connected to Pin 1 of the Target Header. **Figure 3-15** sketches the connection mechanism (looking down into the sockets) for a 14-pin ribbon cable. The 20- and 10-pin ribbon cables use a similar scheme with more or fewer pins, repsectively.

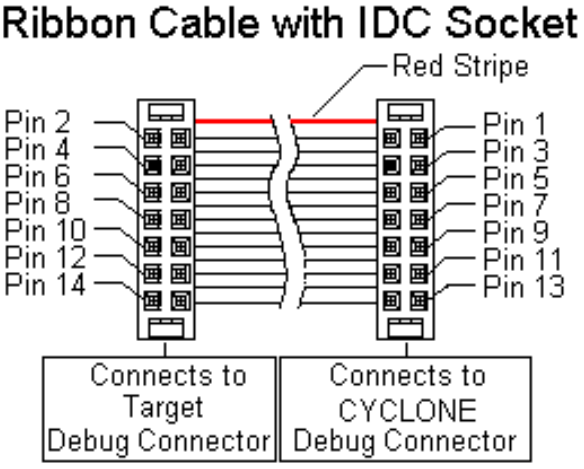

Figure 3-15: Ribbon Cable Diagram When Looking Into IDC Socket

3.13 Target Power Management

The Cyclone for ARM devices provides four power management schemes. The target board may derive power by the use of the power jacks, by the use of the debug connector TVCC pin, or a combination of both. The options are explained in detail below. Each configuration will have an associated jumper setting that MUST be set on the Cyclone for ARM devices. The jumper header is found on the long front side of the unit, directly to the left of the Target Power In and Out jacks.

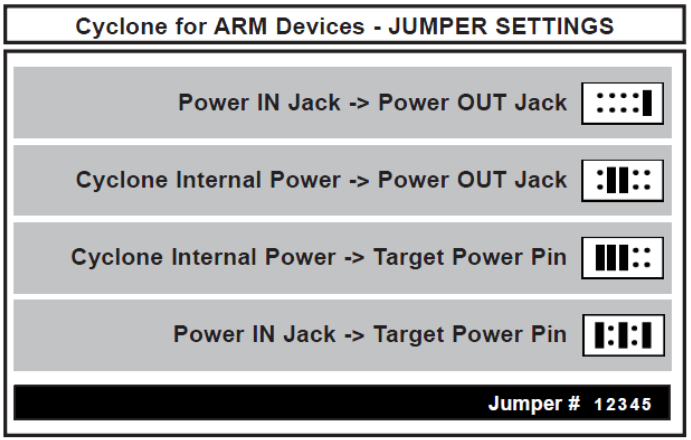
Cyclone for ARM Devices - JUMPER SETTINGS
Power IN Jack -> Power OUT Jack
Cyclone Internal Power -> Power OUT Jack
Cyclone Internal Power -> Target Power Pin
Power IN Jack -> Target Power Pin
Jumper # 12345

Figure 3-16: Jumper Settings, Viewed From Underside Of Cyclone

3.13.1 Using Power In Jack and Power Out Jack

The target power supply is connected to the Power In Jack of the Cyclone for ARM devices. The Power Out Jack of the Cyclone for ARM devices is connected to the target system via the Power In and Power Out jacks. **Figure 3-17** shows the connections.

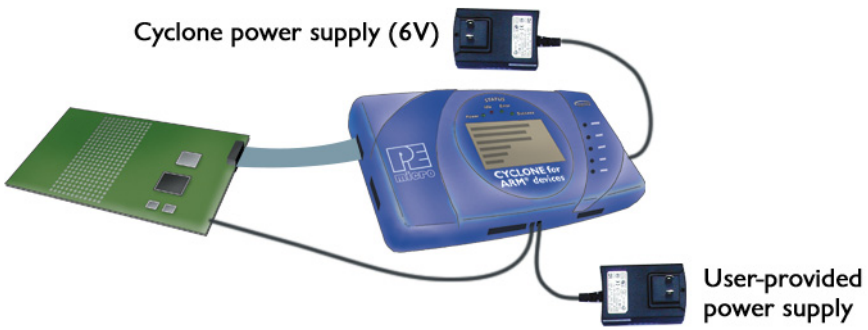

Figure 3-17: Via Power In and Power Out Jacks of Cyclone for ARM devices

All of the jumpers except Jumper 5 should be left open for this mode, as shown in **Figure 3-18**.

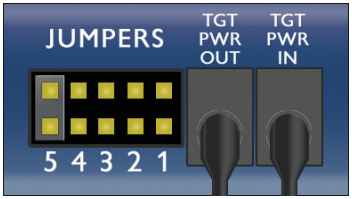

Figure 3-18: Jumper Settings for Target Power Connection via Power In and Power Out Jacks Of Cyclone for ARM devices

Only Jumper 5 is installed.

3.13.2 Using Cyclone for ARM devices Board Power and Power Out Jack

The target power supply is not needed. The Power Out Jack of the Cyclone for ARM devices will act as a center positive power supply to the target system. **Figure 3-19** shows the connections.

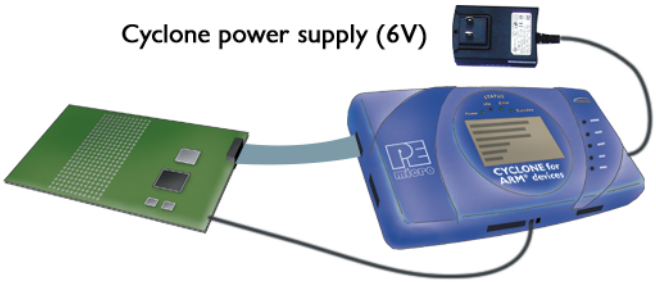

Figure 3-19: Via Cyclone for ARM devices Board Power and Power Out Jack of Cyclone for ARM devices

Jumpers 2 and 3 are enabled. Jumpers 1, 4 and 5 are left open, as shown in **Figure 3-20**.

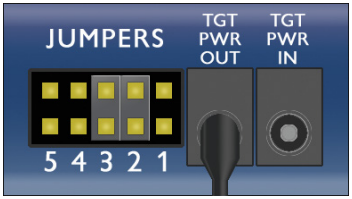

Figure 3-20: Jumper Settings for Target Power Connection via Cyclone for ARM devices Board Power and Power Out Jack of Cyclone for ARM devices

Jumpers 2 and 3 are installed. Jumpers 1, 4, and 5 are left open.

3.13.3 Using Cyclone for ARM devices Board Power and Debug Connector TVCC

The target power supply is not needed. The TVCC pin of the Cyclone for ARM devices' debug connector provides the appropriate voltage for corresponding ARM targets. The Power Out jack of the Cyclone for ARM devices connector is not needed. **Figure 3-21** shows the connections.

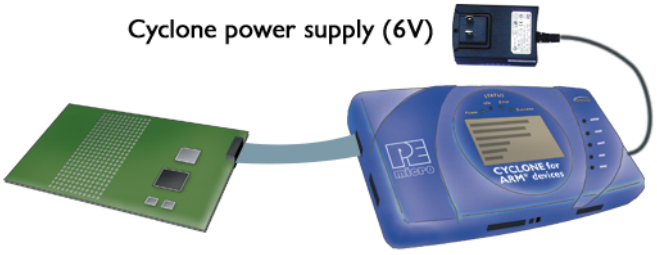

Figure 3-21: Via Cyclone for ARM devices Board Power and TVCC of Cyclone for ARM devices Debug Connector

Jumpers 1, 2, and 3 are enabled as shown in **Figure 3-21**.

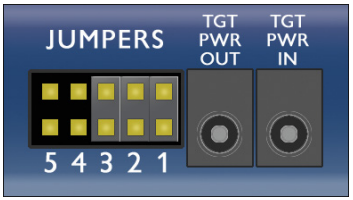

Figure 3-22: Jumper Settings for Target Power Connection via Cyclone for ARM devices Board Power and TVCC of Cyclone for ARM devices Debug Connector

3.13.4 Using Power IN Jack And Debug Connector TVCC Pin

A center positive power supply is connected to the Power IN Jack of the Cyclone for ARM devices. TVCC of the Cyclone for ARM devices debug header connects the external power supply from the Power IN jack to the corresponding ARM target.

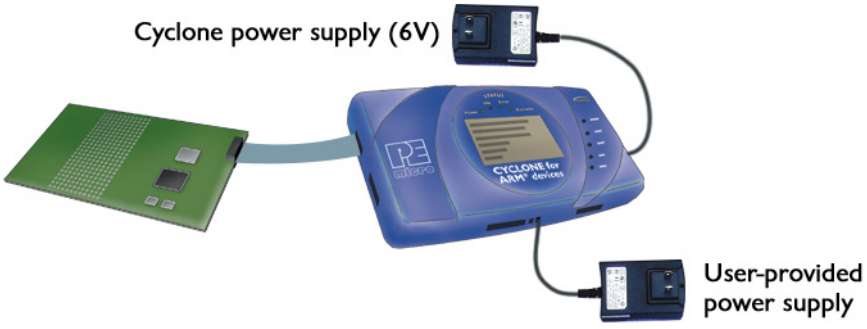

Figure 3-23: Using Power IN Jack And Debug Connector TVCC Pin

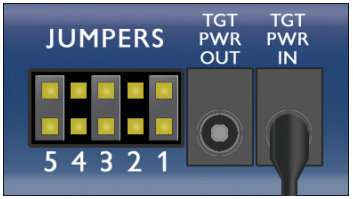

Figure 3-24: Jumper Settings For Power IN Jack And Debug Connector TVCC Pin

Jumpers 1, 3, and 5 are enabled. Jumpers 2 and 4 are left open.

3.13.5 Target Powered Independently Of Cyclone for ARM devices

A target may be powered independently of the Cyclone for ARM devices. The user should remove all jumpers on the Cyclone for ARM devices except jumper 5 if they elect to provide a separate power source for the target.

3.14 CompactFlash Port

The CompactFlash port can be activated by purchasing a CompactFlash Activation License from P&E. The CompactFlash port accepts Type I CompactFlash cards. This allows the user to store programming images that are, individually or collectively, larger than the Cyclone for ARM devices' internal memory (7MB). It also makes swapping programming images quicker and more convenient. A 2GB CompactFlash card is available separately or as part of a CompactFlash activation package.

Purchase of the CompactFlash activation license unlocks the CompactFlash panels in the included Manage Images utility. Programming images may then be managed on the CompactFlash in exactly the same way as they are in the Cyclone's internal memory. Please see **Section 5.2 - Manage Multiple SAP Images** for more information about using the Manage Images utility.

Figure 3-25: CompactFlash Port

4 CYCLONE LCD MENU

This chapter describes the Cyclone for ARM devices' LCD menus. **Figure 4-1** shows an overview of the menu structure.

Note: These menus change as features are added to the Cyclone for ARM devices, so if your menus do not match those displayed here, please check P&E's website, www.pemicro.com, for a user manual containing the latest LCD Menu operations information.

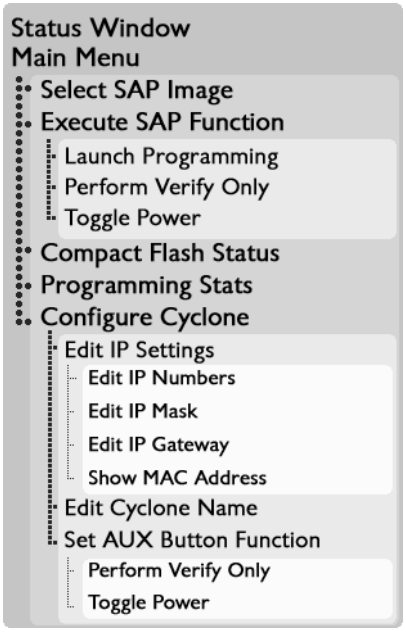

Figure 4-1: LCD Menu Overview

4.1 Status Window

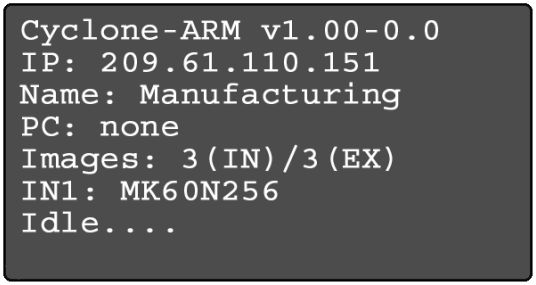

Figure 4-2: Status Window

The status window appears when the Cyclone for ARM devices is powered on. This window lists the following information:

1. Firmware version of the Cyclone.
2. IP address assigned to the Cyclone.
3. Name assigned to the Cyclone.
4. Number of programming images in the Cyclone's memory.
5. Name of the selected programming image.
6. First serial number associated with the selected image
7. Current status.
8. Results of the last operation performed.

4.2 Main Menu

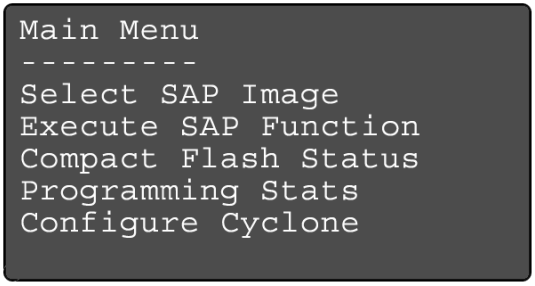

Figure 4-3: Main Menu

The Main Menu is accessible by pressing the “Menu” button when the status window is displayed. The Main Menu contains the following selections:

4.2.1 Select SAP Image

Select SAP Image brings up a display listing the images that are stored in the Cyclone for ARM devices’ memory. You may select the appropriate image by using the Up/Down arrows to highlight it, and then pressing the “Select” button. The image name shown is the one specified in the Cyclone configuration utility when programming the image to the Cyclone.

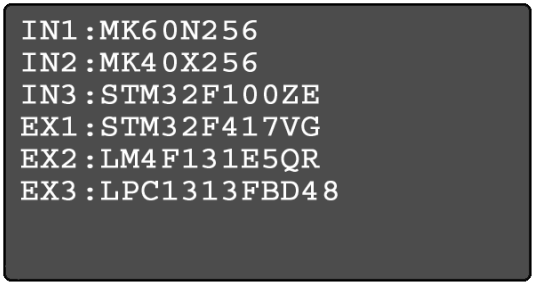

Figure 4-4: Select SAP Image

4.2.2 Execute SAP Function

The Execute SAP Function menu selection is discussed in **Section 6.2 - Operation Via LCD Menu**. Please refer to that section for additional menu information.

4.2.3 Compact Flash Status

The Compact Flash Status menu selection is discussed in **Section 6.2 - Operation Via LCD Menu**. Please refer to that section for additional menu information.

4.2.4 Programming Stats

The Programming Stats menu selection is discussed in **Section 6.2 - Operation Via LCD Menu**. Please refer to that section for additional menu information.

4.2.5 Configure Cyclone

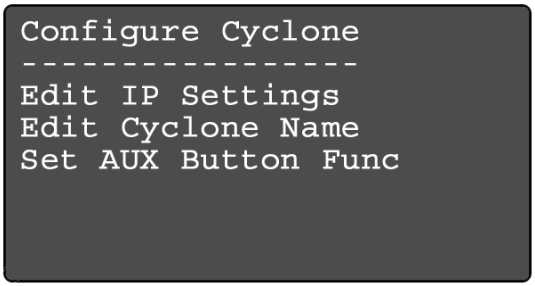

Figure 4-5: Configure Cyclone

Configure Cyclone brings up a submenu with three options from which to choose.

4.2.5.1 Configure Cyclone: Edit IP Settings

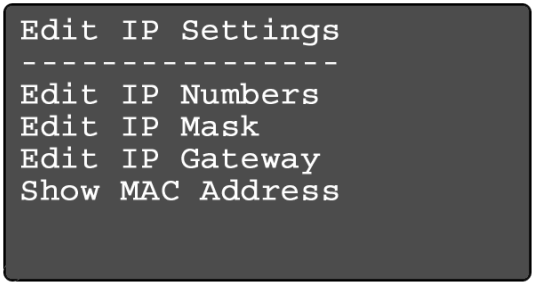

Figure 4-6: Configure Cyclone: Edit IP Settings

Edit IP Settings brings up a submenu with four options from which to choose.

Edit IP Settings: Edit IP Numbers

Edit IP Numbers allows the user to set an IP number for the Cyclone for ARM devices. The current IP number is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the

process. Press the Cancel button at any time to leave the IP number as is and return to the Main Menu.

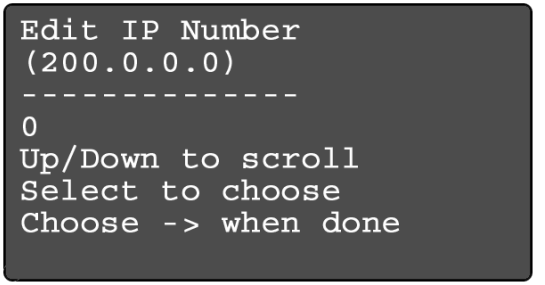

Figure 4-7: Edit IP Settings: Edit IP Number

Edit IP Settings: Edit IP Mask

Edit IP Mask allows the user to set an IP Mask for the Cyclone for ARM devices. The current IP Mask is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process. The default IP mask is 255.255.255.0.

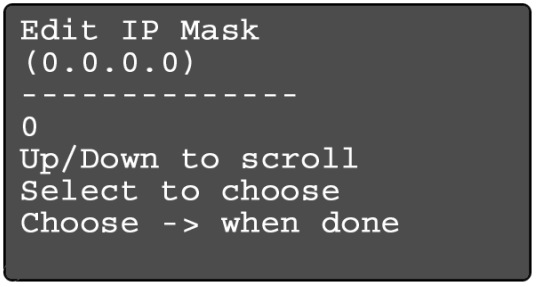

Figure 4-8: Edit IP Settings: Edit IP Mask

Edit IP Settings: Edit IP Gateway

Edit IP Gateway allows the user to set the IP Gateway for the Cyclone for ARM devices. The current IP Gateway is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When

you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process.

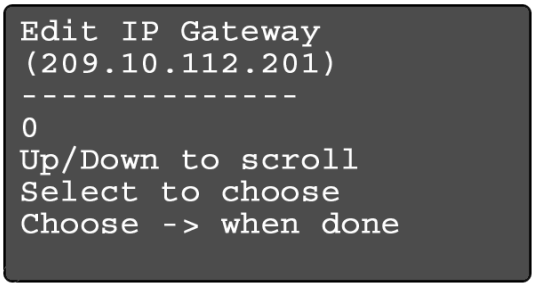

Figure 4-9: Edit IP Settings: Edit IP Gateway

Edit IP Settings: Show MAC Address

Show MAC Address displays the current MAC address for the Cyclone for ARM devices.

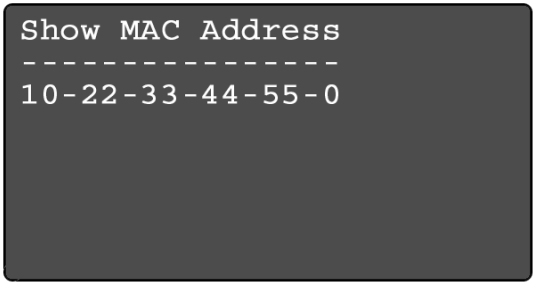

Figure 4-10: Edit IP Settings: Show MAC Address

4.2.5.2 Configure Cyclone: Edit Cyclone Name

Edit Cyclone Name allows the user to set the name for the Cyclone for ARM devices. The current name is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process. Press the Cancel button at any point to leave the name as is and return to the Main Menu.

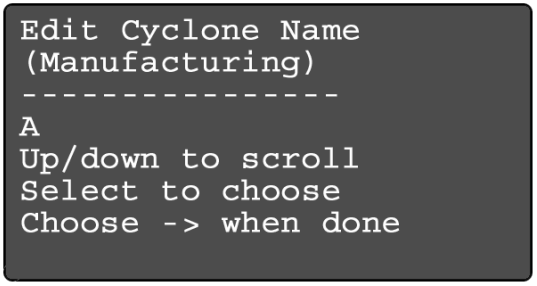

Figure 4-11: Configure Cyclone: Edit Cyclone Name

4.2.5.3 Configure Cyclone: Set AUX Button Func

Set AUX Button Func allows the user to assign a function to the AUX button of the Cyclone for ARM devices. Highlight the function you wish to assign to the AUX button and press the Select button to choose it.

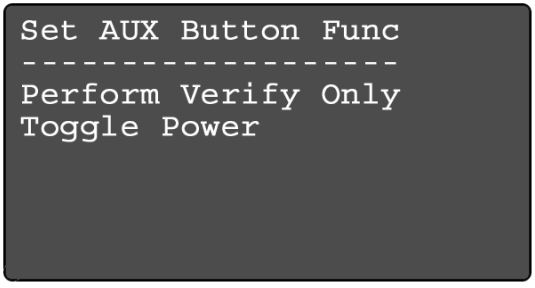

Figure 4-12: Configure Cyclone: Set AUX Button Func

5 STAND-ALONE PROGRAMMER CONFIGURATION

The Cyclone for ARM devices may act as a Stand-Alone In-Circuit Programmer for ARM Cortex devices by Freescale, STMicroelectronics, Texas Instruments (TI), NXP, and others. A simple user interface, CREATEIMAGE.EXE, is provided for configuring the Cyclone.

5.1 Create A Stand-Alone Programming (SAP) Image

This chapter describes in detail how to configure the Cyclone for ARM devices for stand-alone programming using the Cyclone Image Creation Utility, shown in **Figure 5-1**. The Cyclone for ARM devices does not require a target to be connected when it is being configured. However, the power of the Cyclone for ARM devices must be turned on (indicated by the “Idle” LED), and one of the communications interfaces must be connected to the Cyclone for ARM devices if an image is to be stored on it.

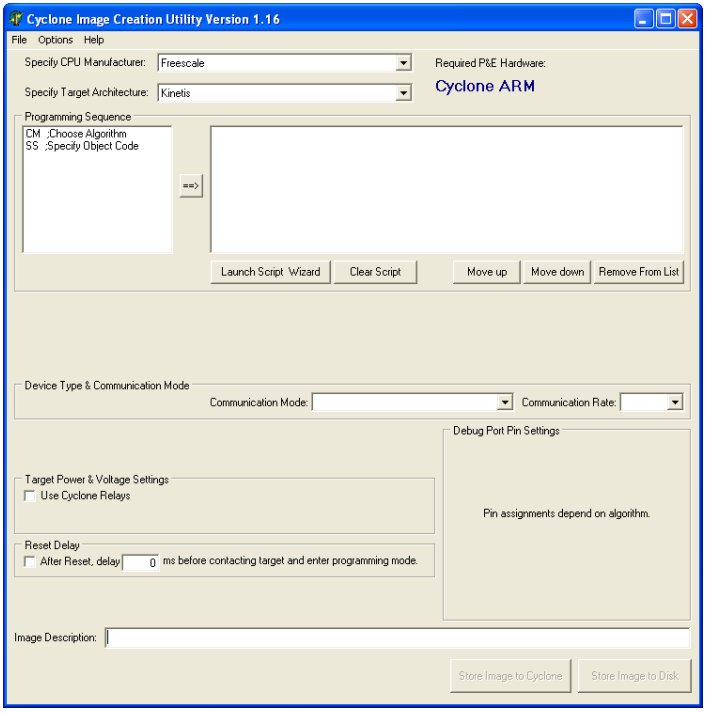

Figure 5-1: Cyclone Image Creation Utility

5.1.1 CPU Manufacturer

The Cyclone for ARM supports ARM Cortex devices by Freescale, STMicroelectronics, Texas Instruments (TI), NXP, and others. The user may select the CPU Manufacturer from the drop-down list.

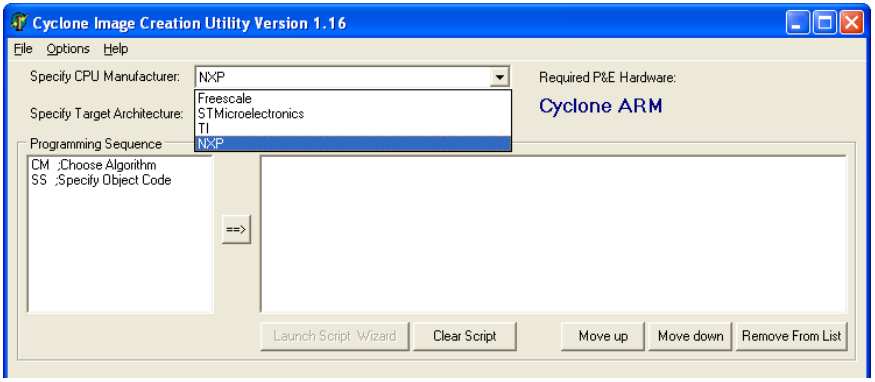

Figure 5-2: CPU Manufacturer Selction

5.1.2 Target Architecture

The various manufacturers will have many different familes of ARM Cortex devices. The user may select the appropriate target architecture from the drop-down list.

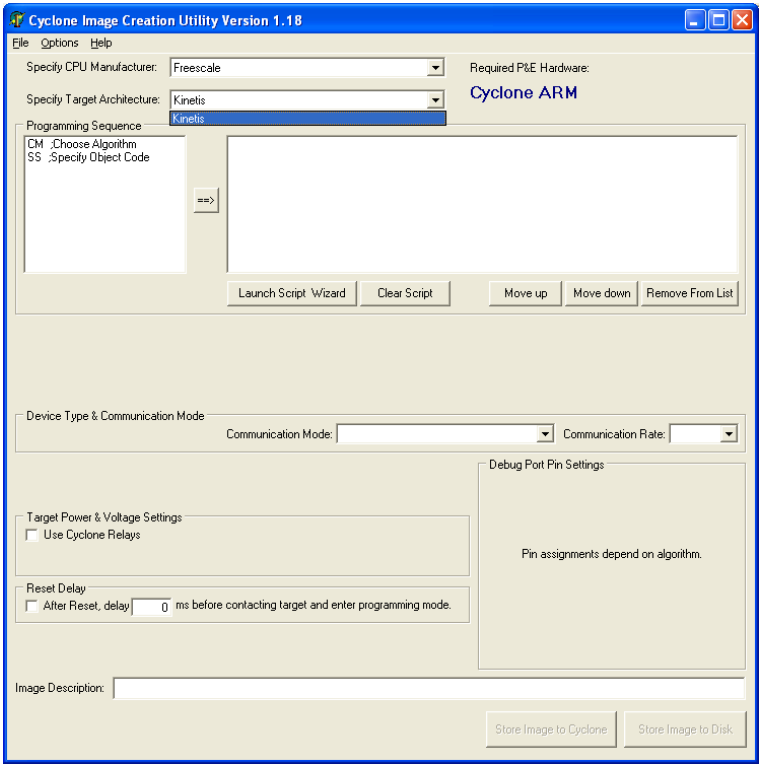

Figure 5-3: Target Class Selection

5.1.3 Specify Programming Script

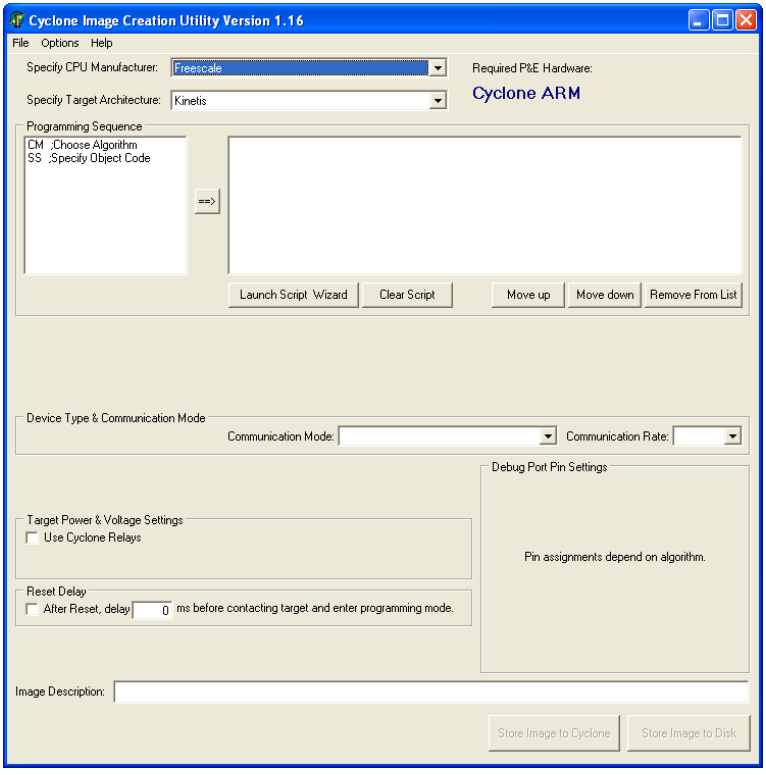

Figure 5-4: Specify Programming Script

This is a two-panel interface. The left panel provides a list of available programming functions. The right panel displays the ordering of the functions.

To specify the programming algorithm for the target, double-click on the Choose Algorithm (CM) function in the left panel. Or, you may highlight it and add it to the right panel using the arrow (->). This opens the Load Programming Algorithm dialog.

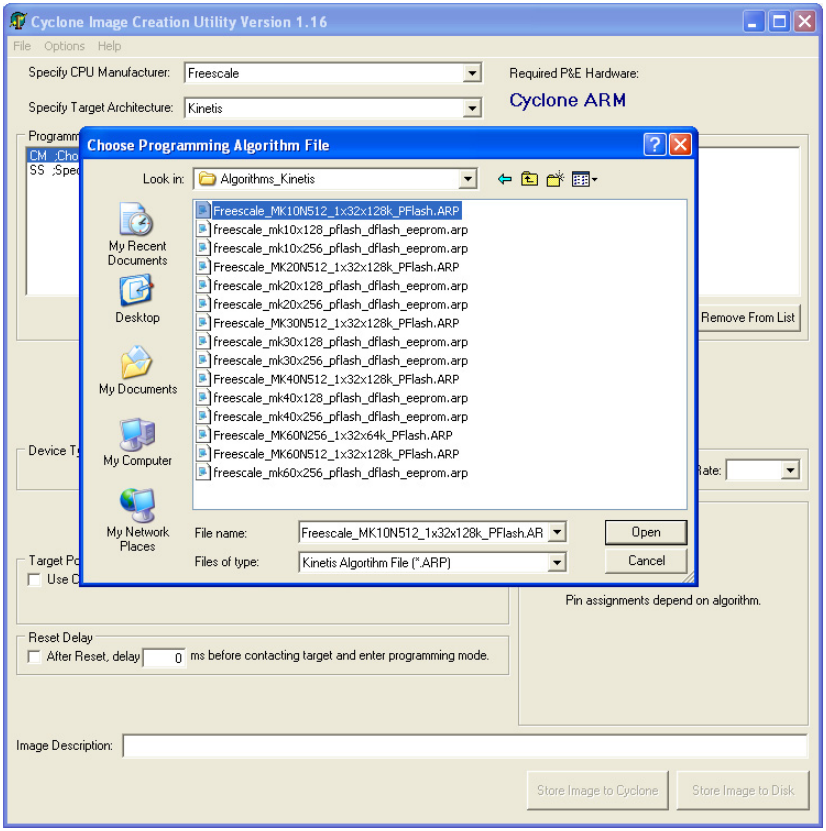

Figure 5-5: Load Programming Algorithm Dialog

Select the programming algorithm that you wish to use.

Similarly, to specify the S-Record to be programmed into the target, double-click on Specify S-Record (SS) in the left panel. This opens a dialog which allows you to select the appropriate S-Record.

Once both the algorithm and S-Record are selected, the full list of programming functions becomes available in the left panel.

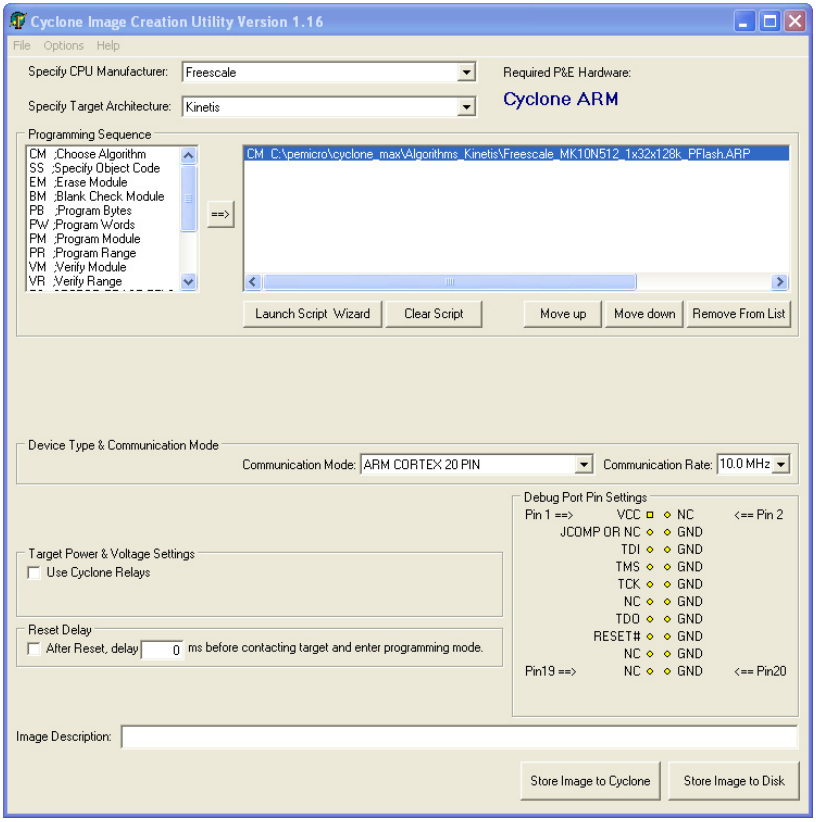

Figure 5-6: Programming Functions Enabled

Next, the user should add additional programming functions to complete the programming script.

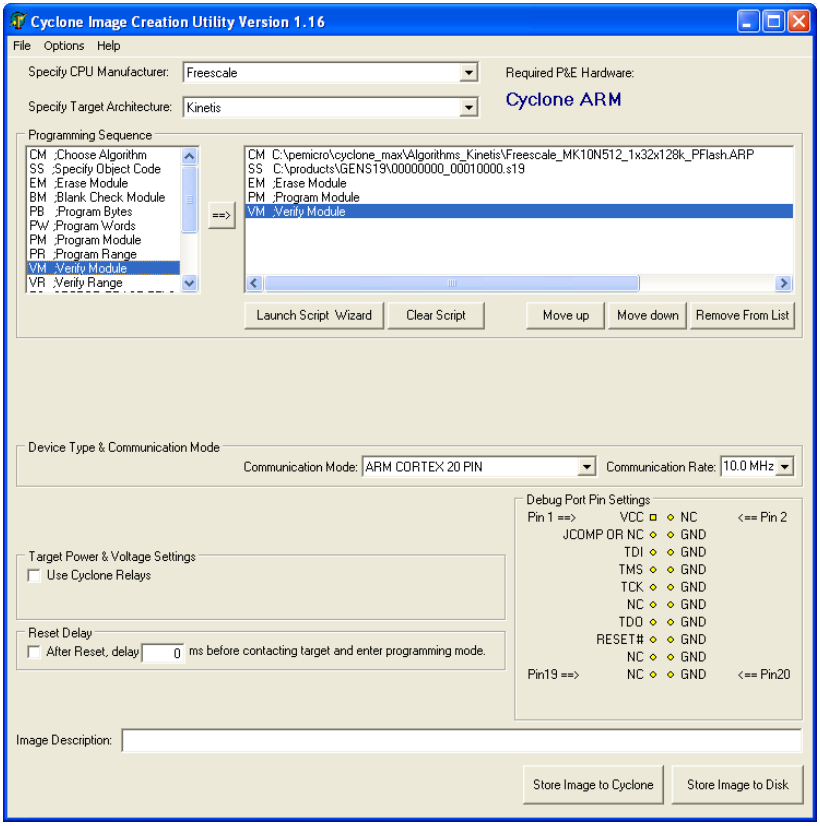

Figure 5-7: Programming Functions Complete

The Launch Script Wizard button prompts the user for a programming module, followed by an S-Record, and creates a default programming script. The user can then modify the programming sequence as needed.

The Clear Script button will remove all programming commands from the right panel.

The Move Up and Move Down buttons allow the user to manually re-sequence the order of the programming commands.

The Remove From List button can be used to remove a selected command from the right panel.

At this point the image can be saved to a disk or to the Cyclone for ARM

devices device. For more information, please see **Section 5.1.8 - Store Image To Cyclone**.

5.1.4 Programming Operations

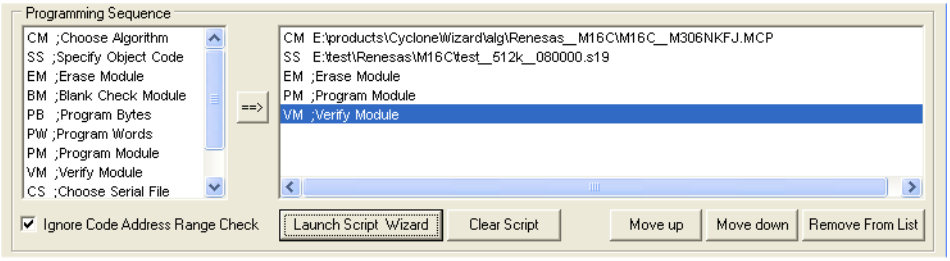

Figure 5-8: Programming Operations Dialog Section

In the Programming Sequence field, the user may specify the algorithm, S-Record, and operations to be carried out.

Choose Module

Presents a list of available programming files. Each programming file contains information on how to program a particular module. Usually, the name of the file indicates what kind of module it relates to.

Specify S-Record

Asks for the name (and/or path) to a file of ARM S-records to be used in programming or verifying a module. If the file is not found, an error message is given. The currently-selected file is shown in the S19 file selected window. The programmer accepts S1, S2, and S3 records. All other file records are treated as comments. If you do not specify a file-name extension, a default of .S19 is used. The programmer also supports ELF/Dwarf 2.0 object files.

Your S19 file may contain data for both EEPROM and flash. If you know that your S19 file contains the correct data, “Ignore S19 Range” may be checked. This will cause any out of range errors to be ignored.

Erase If Not Blank

This command performs a blank check of the module and erases it if it is not blank.

Erase Module

If “Erase Module” is specified, the Cyclone for ARM devices will perform an “Erase Module” on the target device after entering the Monitor Mode or BDM mode.

Blank Check Module

If “Blank Check Module” is checked, the Cyclone for ARM devices will perform a “Blank Check Module” on the target device.

Program Bytes

Prompts for a starting address, which must be in the module. You are then asked to enter in hexadecimal a byte to be programmed into the current location. Clicking the OK button will automatically advance to the next data byte location.

Program Words

Prompts for a starting address, which must be in the module. You are then asked to enter in hexadecimal a word to be programmed into the current location. Clicking the OK button will automatically advance to the next data word location.

Program Module

For this command to work, you must have previously selected an S-record file.

Verify Module

For this command to work, you must have previously selected an S-record file.

Verify Checksum

This command verifies the module content via a CRC calculation.

Choose Serial File

This command becomes available once a programming algorithm is selected. It specifies the serial file that holds the serial numbers to be programmed to the target. Please reference **CHAPTER 11 - AUTOMATIC SERIAL NUMBER MECHANISM** for more information about programming serial numbers.

Program Serial Number

This command becomes available once a programming algorithm is selected. It will instruct the Cyclone for ARM devices to program the serial number to the target once executed. As with other commands, the serial number will not be programmed until the SAP operations are carried out. Please reference

CHAPTER 11 - AUTOMATIC SERIAL NUMBER MECHANISM for more information about programming serial numbers.

5.1.5 Commincation Mode and Rate Settings

Cyclone for ARM devices supports multiple communication modes and communication rates. A user needs to select proper communication mode and rate from the drop down list after programming operations are specified. The debug connector pin definitions are listed for reference.

5.1.6 Target Voltage and Power Settings

A user may elect to use Cyclone for ARM devices to supply power to the target. In this case, the Target Voltage specifies the target MCU I/O voltage level.

The user needs to take into account the power discharge time for the Power Down delay. The reset driver delays, power stabilization time, and the target clock stabilization time should be considered for the Power Up delay.

A checkbox is available for a user to instruct the Cyclone for ARM devices to turn off target power after SAP operations. If unchecked, the target power will remain on.

The user has the option to provide Reset Delay if certain reset monitoring devices are used. The Cyclone for ARM devices will delay for the specified time after allowing the target out of reset.

5.1.7 Image Description

The Cyclone for ARM devices Configuration Utility allows the user to summarize the purpose of current configuration for future reference. The description will be either programmed into the Cyclone for ARM devices or saved into an encrypted file.

The image description will appear on the LCD screen for image identification. Since the LCD can display up to 16 characters, it is recommended to keep the description concise.

This field will not affect the Cyclone for ARM devices's operations with the target.

5.1.8 Store Image To Cyclone

"Store Image to Cyclone" allows the current configuration to be programmed

into the Cyclone for ARM devices. The Cyclone for ARM devices will then be ready for operations.

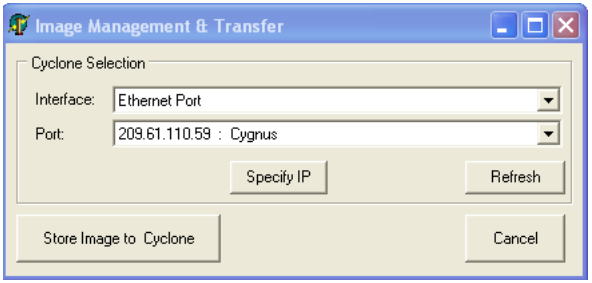

Figure 5-9: Image Management And Transfer Dialog

The Interface drop-down list allows the user to select one of three Serial, USB, or Ethernet interfaces. The Port drop-down list allows the user to select from one of the Cyclones available on that interface. In the case of a Cyclone present on a different network (i.e., not displayed automatically in the Port drop-down list), the user may specify its IP address by using the Specify IP button.

“Store Image to Cyclone” will then store the image on the selected Cyclone.

5.1.9 Store Image To Disk

“Store Image To Disk” allows the current configuration to be saved onto the hard drive. The image can then be transferred to the Cyclone for ARM devices internal flash or external CompactFlash (with activation) via the Manage Images Utility.

5.1.10 Save Cyclone Configuration

“Save Cyclone Configuration,” in the file menu, allows the user to save the configuration into a file, which may be used for future reference, e.g., comparing the Cyclone for ARM devices contents with the file to see if they are the same.

5.1.11 Load Cyclone Configuration

“Load Cyclone Configuration” in the file menu allows the user to load a configuration that has previously been saved in order to create a new image.

5.2 Manage Multiple SAP Images

The Manage Images utility, shown in **Figure 5-10**, allows the Cyclone to store and manage multiple images in the Cyclone's internal memory. Once the programming images have been created and saved to the disk using the Create Image utility, they may then be loaded collectively onto the Cyclone. If you have purchased a CompactFlash activation license it will also allow you to store and manage multiple images on any compatible CompactFlash cards that are loaded into the Cyclone's CompactFlash port.

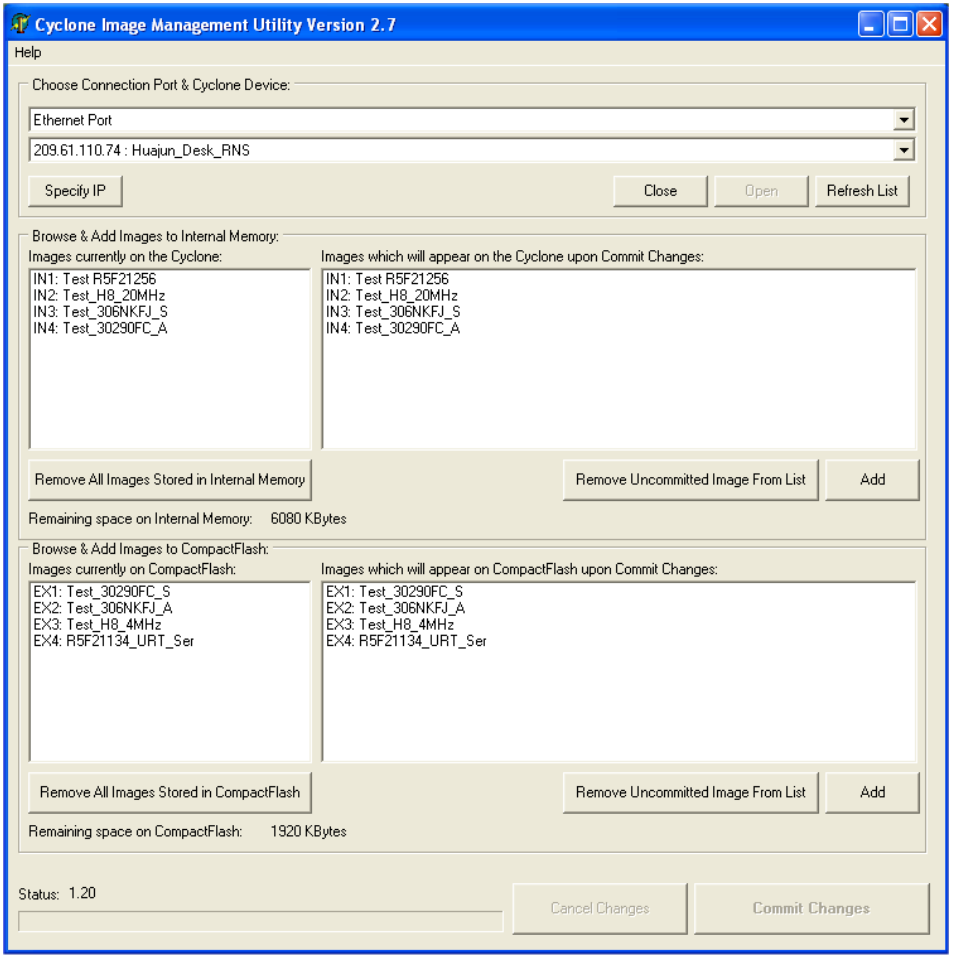

Figure 5-10: Manage Images Utility

Upon opening a selected Cyclone for ARM devices, the user is provided in the top left panel with a list of the images currently on the unit's internal memory. If the CompactFlash license has been activated, a list of images on any connected CompactFlash card will also be displayed in the bottom left panel. The panels to the right can be used to add or delete additional images by using the Add and Remove buttons beneath each panel.

Once the images that you wish to load appear in the panels to the right, you must press “Commit Changes” to load the Cyclone accordingly. No changes are made to the Cyclone for ARM devices until the “Commit Changes” button is pressed.

Note: Any images that are already stored on the Cyclone for ARM devices or CompactFlash can only be removed by using the corresponding “Remove All Images...” button.

5.2.1 Optional CompactFlash Activation License

The CompactFlash Activation License is a license key, available for purchase separately, which activates the Manage Images Utility and enables it to be used with the Cyclone’s CompactFlash card interface. Activation of the CompactFlash interface allows for programming of larger datasets and for the storage of multiple programming images on a CompactFlash card.

For more details, please refer to **Section 3.14 - CompactFlash Port**.

6 STAND-ALONE PROGRAMMER MANUAL CONTROL

The Cyclone for ARM devices must be configured before it may serve as a Stand-Alone Programmer for ARM targets. The user may manually control the Cyclone for ARM devices: via the buttons/LEDs, LCD menu, or via PC software. The target power management schemes remain the same for each control method.

6.1 Operation Via Cyclone for ARM devices Buttons

There are five (5) buttons on the top of the Cyclone for ARM devices which are used for stand-alone programming and to navigate the LCD menus. They are specified as follows.

Button	Function
START / ↑	Start executing the tasks pre-configured into the Cyclone for ARM devices.
	Menu Mode: Navigate upwards in LCD menu.
AUX / ↓	Perform auxiliary function (stand-alone verification).
	Menu Mode: Navigate downwards in LCD menu.
MENU / [SELECT]	Toggles ON/OFF the Target Board Power.
	Menu Mode: Select highlighted item in LCD menu.
CANCEL	Cancel the tasks being executed and go back to the idle state.
RESET	Hardware reset of the Cyclone for ARM devices.

6.1.1 Cyclone for ARM devices LED Indicators

The Cyclone for ARM devices has four (4) LEDs to indicate the current operation stage.

LED	FUNCTION
Power	Indicates that the target board power is connected.
Idle	The Cyclone for ARM devices is waiting for instructions.
Error	The Cyclone for ARM devices failed to execute the functions as instructed.
Success	The Cyclone for ARM devices executed the functions successfully.

6.1.2 Procedure via Buttons and LEDs

The following steps must be followed in order for the Cyclone for ARM devices to operate properly after the Cyclone for ARM devices has been configured:

1. Turn off the target power supply if the “POWER IN” Jack is adopted.
2. Turn off the Cyclone for ARM devices board power.
3. Set the correct Jumper settings.
4. Connect the target power supply to the “POWER IN” Jack, if applicable.
5. Connect the “POWER OUT” Jack to the target board power, if applicable.
6. Connect the ribbon cable to the target debug connector.
7. Turn on the Cyclone for ARM devices board power.
8. Turn on the target power supply, if applicable.
9. Press the “START” push button on the Cyclone for ARM devices.

When the “Success” LED lights up, you have successfully programmed your target.

6.1.3 Example

When the Cyclone for ARM devices is powered up, the Idle LED is turned on. After the user programs the contents and procedures into the Cyclone for ARM devices on-board flash, the Cyclone for ARM devices may be used as a Stand-Alone Programmer. Suppose the user wants to perform the following instructions for a target device:

1) Erase Module
2) Program Module
3) Verify Module.

When the Start Button is pressed, the “Power” LED will turn on, indicating that the Cyclone for ARM devices is powering up the target board.

Then the “Idle” LED will turn off.

Finally, if these operations have been performed successfully, the “Success” LED and the “Idle” LED will be illuminated. One stand-alone programming cycle will have just been completed.

6.2 Operation Via LCD Menu

The Cyclone for ARM devices may be operated by making selections from the LCD menu. This section describes the layout of the menus and the functions that each may be used to perform.

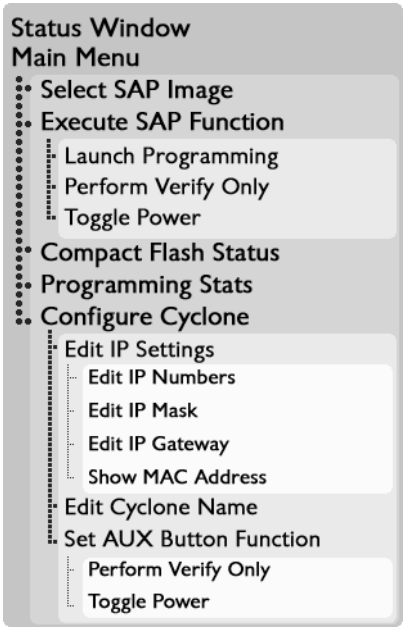

Figure 6-1: LCD Menu Overview

6.2.1 Status Window

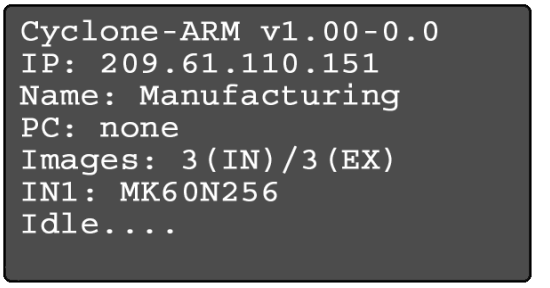

Figure 6-2: Status Window

The status window appears when the Cyclone for ARM devices is powered on. This window lists the following information:

1. Firmware version of the Cyclone.
2. IP address assigned to the Cyclone.
3. Name assigned to the Cyclone.
4. Number of programming images in the Cyclone's memory.
5. Name of the selected programming image.
6. First serial number associated with the selected image
7. Current status.
8. Results of the last operation performed.

6.2.2 Main Menu

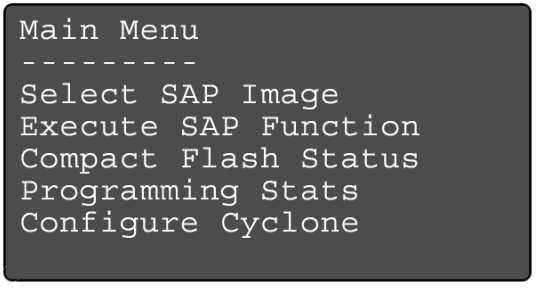

Figure 6-3: Main Menu

The Main Menu is accessible by pressing the “Menu” button when the status window is displayed. The Main Menu contains four selections. This section contains information on Execute SAP Function and Show Statistics. For information on Select SAP Image and Configure Cyclone, please refer to **CHAPTER 4 - CYCLONE LCD MENU**.

6.2.2.1 Execute SAP Function

Execute SAP Function presents three Stand-Alone Programming functions that you may execute by highlighting the function that you wish to execute and pressing the “Select” button.

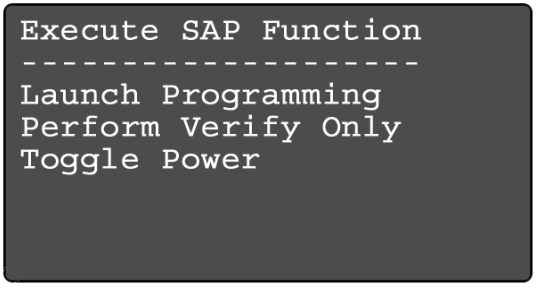

Figure 6-4: Execute SAP Function

6.2.2.2 Compact Flash Status

If a compatible CompactFlash card is loaded into the Cyclone, the Compact Flash Status menu selection displays information about that CompactFlash card, including its name, the number of images it contains, and the amount of free, used, and total memory it contains.

Figure 6-5: Compact Flash Status

6.2.2.3 Show Statistics

The fourth line (PCIP:) displays the IP address of the last PC to control the Cyclone for ARM devices. The other categories listed are for future use and are not currently implemented.

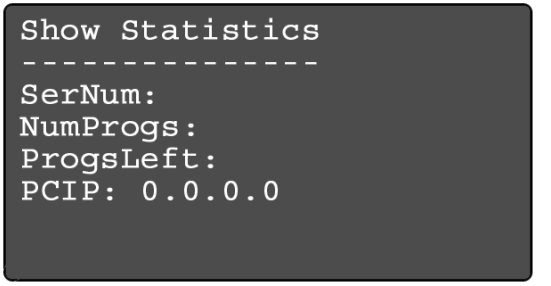

Figure 6-6: Show Statistics

6.3 Cyclone Battery Pack

Manual control of stand-alone mode is also useful for performing field updates. In this situation, there is often no access to a PC or power outlet. However, the Cyclone may be powered by using a Cyclone PowerPack, which is a lightweight and compact lithium ion battery (available separately).

Figure 6-7: Cyclone with Cyclone PowerPack

The combination of the Cyclone for ARM devices programmer and the battery pack creates a fully operational field programming setup that is lightweight, compact, and extremely portable. All that is required for a field update is to connect the battery-powered, pre-programmed Cyclone to the target and initiate programming.

7 STAND-ALONE PROGRAMMER AUTOMATED CONTROL

Users who wish to automate control of one or more Cyclone units have several options available. This chapter presents a brief overview of those options along with some additional information about each.

7.1 Cyclone Automated Control Package - Overview

Every Cyclone includes the Basic Edition of P&E's Cyclone Automated Control Package. P&E also offers advanced versions of the control package which may be purchased separately.

7.1.1 Basic Edition

The Basic Edition, included with the Cyclone for ARM devices, gives users two options for automating control of the Cyclone.

1. **Cyclone Launch Application**

   The Cyclone Launch application allows control of **one or more** P&E Cyclone units through the usage of simple **batch and script files**.

2. **Dynamic Link Library (.DLL)**

   The .DLL in the Basic Edition allows custom software applications to control **one** Cyclone unit.

Users wishing to use a .DLL to control more than one Cyclone or who would prefer to use RS232/Ethernet protocols (e.g., in a non-Windows environment) may purchase the appropriate advanced version of the Cyclone Automated Control Package.

7.1.2 Professional Edition

The Professional Edition is available separately. It contains a dynamic link library **(DLL)** which allows custom software applications to control **up to three** Cyclone units.

7.1.3 Enterprise Edition

The Enterprise Edition is available separately. It contains a dynamic link library **(DLL)** and the ability to use custom software, **RS232 and Ethernet** communication protocols to control an **unlimited** number of Cyclones.

More details about what is included with each edition of the Cyclone Automated Control Package may be found at www.pemicro.com.

7.2 Cyclone Automated Control Package - Details

This section presents brief descriptions of the Cyclone Launch Application, .DLL and RS232/Ethernet options that are offered by P&E's various Cyclone Automated Control Packages. Detailed operational instructions for these tools are beyond the scope of this manual. For operational instructions, please consult P&E's *Cyclone Automated Control Package - Developer's Manual*, which accompanies the Basic Edition of the Cyclone Automated Control Package. This manual may also be downloaded from www.pemicro.com.

7.2.1 Cyclone Launch Application

The Cyclone Launch application is included with every edition of the Cyclone Automated Control Package. It allows a developer to use simple ASCII script files to control Cyclone operations from the PC. Once the script files are configured, a simple batch file can be created to initiate programming operations on one or more Cyclone units. Cyclone Launch also supports features such as stand-alone image maintenance and dynamic data programming, which provides a powerful but easy-to-use interface. The Cyclone Launch application is ideal for getting your automated production environment up and running in a very short amount of time.

7.2.2 .DLL Control

The dynamic link library (DLL) that is included in all editions of the Cyclone Automated Control Package allows you to create an application on the PC that can directly control one (Basic Edition) or more P&E Cyclone units. Please see **Section 7.1 - Cyclone Automated Control Package - Overview** for the number of Cyclones that may be controlled by each version of the package.

These interface routines are designed to be compiled into visual and non visual applications running on Windows 95, 98, ME, NT, 2000, XP, Vista, 7. The actual interface routines are located in the "CYCLONE_CONTROL.DLL" 32 bit DLL file. The DLL is callable from almost any 32-bit Windows development environment. Since the way the DLL is called varies depending on the compiler used, you are provided with the DLL interface code and sample applications for each of the following compilers:

Borland Delphi 2.0+ (Pascal) - Visual Application

Microsoft Visual C++ 5.0+ - Visual MFC Application

Microsoft Visual C# 2005+ - Visual Application

These sample applications come with project and workspaces defined for ease of use. Simply open the project/workspace in your compiler and you should be able to build the sample application without any modifications. The sample applications come pre-compiled with ICONS, so you can run them before jumping into the code.

7.2.3 RS232 / Ethernet Communication Protocols

The RS232 and Ethernet Communication protocols included with the Enterprise Edition of the Cyclone Automated Control Package allow a developer to manually send individual command packets to control each Cyclone unit. This is ideal for setups that do not have access to a PC or production environments that do not run Windows-based computers.

8 ETHERNET CONFIGURATION

This section describes the mechanism used by the Cyclone for ARM devices device to transact data over an Ethernet network. It primarily focuses on the User Datagram Protocol (UDP), which is a popular method for sending data over a network when the speed of a data transaction is of more concern than the guarantee of its delivery. The Cyclone takes advantage of the UDP protocol's penchant for speed, and adds an extra layer of logic to guarantee the delivery of UDP packets in order to offer a best-of-both-worlds solution.

8.1 Network Architectures

Before delving into the innards of Ethernet message passing, it is prudent to briefly describe the different network architectures in use today, and how they pertain to the operation of the Cyclone. Computers are, of course, connected to one another through intermediary devices in order to form networks. There are several classes of these intermediary devices, but they generally fall into one of the following three groups:

Hubs

At the most basic level, computers are connected to one another through a Hub. A Hub is a device with several ports that are used to connect multiple computers together. It is a repeater device – a Hub simply copies the data incoming on one port as data outgoing on the other ports. In this manner, if there are four computers connected through a Hub, and if the first computer is sending data to the second computer, then the third and the fourth computers will also receive an identical copy of that data. Hubs are usually used to set up a small Local Area Network (LAN), which may have on the order of 10 to 20 computers.

Switches

The aforementioned type of process, where the data is simply replicated onto every available port, quickly becomes inefficient for larger sized networks. For this reason, a larger sized LAN employs the usage of Switches instead of Hubs. A Switch is essentially a smart Hub, in that it limits the input and output of data to the two transacting computers.

Routers

Larger networks, such as Wide Area Networks (WANs), or the Internet for that matter, use progressively more sophisticated devices to transact data. At the core of these devices is the Router, which functions as a switch between networks.

The Cyclone performs irrespective of the connection mechanism, with one very important caveat: it needs to be set up with the appropriate network parameters for the underlying network architecture.

8.2 Network Parameters

A typical network becomes operational not after the physical connections have been established, but after network parameters in the form of IP (Internet Protocol) numbers have been assigned to the individual computers. An IP number is a unique string that consists of four numbers ranging between 0 and 255, separated by dots, e.g., 192.168.1.2. Every computer that is on a network needs to have a unique IP number. The computer uses this IP number to identify itself on the network, and also to address the recipient of its data.

Assignation of this IP number is sufficient information to transact data on a simple network connected by a hub. On a more complex network, however, routing information becomes important. The routing information consists of two more IP numbers. The first of these is called the Subnet Mask, and is used to determine whether or not the destination address resides on the same subnet (i.e., doesn't need to be forwarded to another network). The other IP number is the Gateway Address, which is the address of the computer that handles forwarding and receiving of packets to and from other networks.

Before first use, the Cyclone needs to be programmed with a unique IP number, the Subnet Mask IP number, and also the default Gateway's IP number. This can be done via the USB or the Serial port, and is described in

greater detail in the “Configuring the Cyclone” section of this manual.

8.3 Internet Protocol

Once the network has been established, and the IP numbers have been assigned, data can be transacted over a network with one of several protocols. By far the most prevalent protocol is the Transmission Control Protocol (TCP), which runs on top of the Internet Protocol in what is collectively known as the TCP/IP protocol. The TCP/IP protocol was developed by the Department of Defense to connect different computers from different vendors by a “network of networks,” which has become what is known as the Internet today.

The primary purpose of the TCP/IP protocol was to prevent a complete network outage in the case of a nuclear attack, by automatically rerouting data traffic through the functioning part of the network. As such, the TCP/IP mechanism guaranteed delivery of data packets by introducing a system of acknowledgements and sequence numbers for the data packets. This mechanism, while good for transacting large amounts of data (such as email or file transfers), is unsuitable in the real-time type environment in which the Cyclone operates. Because the Cyclone needs to transact data as quickly as possible to the target, it takes advantage of TCP/IP’s alternative, the UDP/IP protocol.

Unlike TCP/IP, the UDP/IP protocol is a connectionless, single-packet protocol that sends short data packets at the expense of not guaranteeing their delivery. This makes the UDP/IP protocol efficient in real-time applications such as broadcasting video over the Internet, where the occasional loss of a frame of data is not going to hamper the overall viewing experience. Left unmodified, the UDP/IP, with its lack of guarantees for packet delivery, would be unusable in an environment where the delivery of a single byte of data needs to be guaranteed. The Cyclone firmware adds mechanisms to the UDP/IP protocol, without affecting its underlying efficiency, to guarantee delivery of data packets.

8.4 Connecting The Cyclone Device

There are two methods for establishing a connection between a Cyclone and a PC with an Ethernet cable. The most basic method is to connect the Cyclone directly to a PC, via a cross-over Ethernet cable. However, the more common method is to place the Cyclone and the PC on the same network

through a Hub.

8.4.1 Connecting the Cyclone to the PC over a network:

The Cyclone was intended for use on a network of multiple computers (and other Cyclones). There are many possible network configurations, and to describe them all is beyond the scope of this document. However, most configurations are a modification of a basic theme, which is that of connecting one or more PCs through a Hub to one or more Cyclones.

In order to connect these devices to the Hub, you will need to use the provided straight-through Ethernet cable. The straight-through cable, which is the “standard” Ethernet cable, is used to connect devices of different types together, such as a PC to a Hub, or a Hub to a Cyclone.

At this point it once again becomes necessary to program the Cyclone with valid IP numbers, the process for which is described in greater detail in the following section. However, it is important for the Cyclone and the PCs to have matching Subnet and Gateway IP numbers, and for each to have a unique IP number on the network. An example of a setting for above is as follows:

	IP Number	Gateway IP	Subnet Mask
PC1	192.168.100.1	192.168.100.3	255.255.255.0
PC2	192.168.100.2	192.168.100.3	255.255.255.0
CYCLONE	192.168.100.4	192.168.100.3	255.255.255.0
Gateway	192.168.100.3	192.168.100.3	255.255.255.0

It is important to briefly touch upon the underlying network architecture, which can be a 10Mb (Megabit), 100Mb, 10/100Mb, half-duplex, or a full-duplex connection. The details of the underlying network architecture are beyond the scope of this document, but it is sufficient to note that most modern network cards, as well as the Cyclone device, have the capability to configure themselves for the underlying network through the Auto-negotiation mechanism. Auto-negotiation is performed as soon as a network cable is connected to the device, and it sets the operating parameters of the device to match those of the network.

8.4.2 Connecting Cyclone-to-PC via an Ethernet cable

In order to connect the Cyclone to a PC directly via an Ethernet cable, you need to use what is known as a cross-over cable. A cross-over cable, which is

not provided by P&E, is normally used to connect two similar devices such as a PC to a PC, or a Hub to a Hub. It is a cable that has its receive and transmit wires crossed over so that the similar devices can effectively communicate with one another.

With this configuration, it is still important to assign IP numbers to both the PC and the Cyclone device. Although at first glance it may not seem necessary to assign a Gateway address in this configuration, the Cyclone was designed to operate on a network of more than two computers, and therefore it needs to be programmed with a Gateway address.

Assuming the desktop's IP number to be 192.168.100.1, this is an example of the three IP numbers that would need to be programmed into the Cyclone:

	IP Number	Gateway IP	Subnet Mask
PC	192.168.100.1	none	255.255.255.0
CYCLONE	192.168.100.2	192.168.100.1	255.255.255.0

For more information on programming these IP numbers into the Cyclone device, please see the following section.

8.5 Cyclone IP Setup Via LCD Menu

For instructions on how to configure the Cyclone for ARM devices using the LCD Menu, please see **Section 6.2 - Operation Via LCD Menu**.

8.6 Cyclone IP Setup Utility User Interface (ConfigureIP)

Before the Cyclone device transacts data on an Ethernet network, it will need to be configured with the relevant network parameters. The application that provides this capability is the Cyclone IP Setup Utility (ConfigureIP), which can be found as part of the distribution software.

This utility is used to configure the Cyclone for ARM devices with network parameters, and also to update the firmware of the Cyclone for ARM devices.

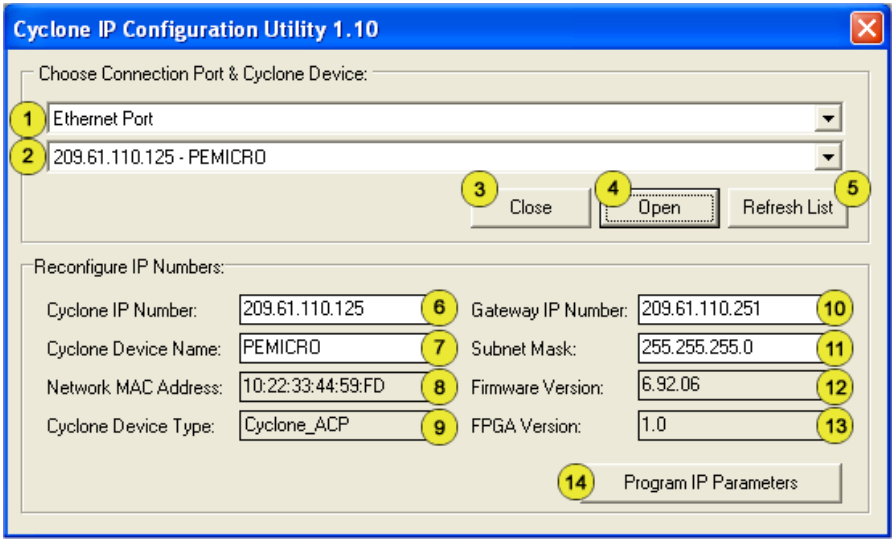

Figure 8-1: IPSetup.exe Default Screen

(1) Drop-down Box 1

There are three options available in this drop-down box, of which "Ethernet Port" is displayed. The other options are "Serial Port" and "USB Port". Changing to any one of the three Ports will list the devices which are found over that specific Port.

(2) Drop-down Box 2

Once one of the three (Serial, USB, or Ethernet) communication interfaces has been selected in the first drop-down box, a list of all available Cyclone devices over that interface will be displayed for selection.

(3) Close Button

The "Close" button is active only when a device has been opened for access. Once a device has been opened for access, it needs to be closed before another device can be opened for access.

(4) Open Button

The "Open" button opens a device for access. This is a required step before changing the parameters on the selected device. Once a device

has been selected through the second drop-down box and is opened for access, its information will be displayed at the bottom of the dialog box.

(5) Refresh List

Will refresh the dialog boxes by searching for devices which are currently connected via the Serial or USB interfaces, or are found on the network.

(6) Cyclone IP Number

This is the IP number which will be associated with the Cyclone for ARM devices. It needs to be a unique IP number which can be accessible on the network.

(7) Cyclone Device Name

This is a label which can be used to identify the Cyclone for ARM devices by name, e.g., “John’s Cyclone” or “Manufacturing Floor.”

(8) MAC Address

This is the Media Access Control address, the unique number of an Ethernet device on the network. This is programmed by P&E and cannot be modified.

(9) Cyclone Device Type

This displays the type of Cyclone hardware.

(10) Gateway IP Number

The IP number of a gateway on the network.

(11) Subnet Mask

The subnet mask of the network.

(12) Firmware Version

A read-only field which returns information pertaining to the build date and firmware version of the Cyclone for ARM devices device.

(13) FPGA Version

A read-only field which returns the hardware version of the FPGA.

(14) Program Cyclone Parameters

This button saves the information as it appears in the "Reconfigure IP Numbers" area onto the Cyclone device.

8.7 Using ConfigureIP.exe To Configure The Cyclone for ARM devices

Before the Cyclone for ARM devices is ready to communicate over an Ethernet network, it will need to be configured with the relevant network parameters. The application that provides this capability is the Cyclone Configuration Utility (IPSetup.exe), and is provided as part of the standard Cyclone for ARM devices software distribution.

In order to update the network parameters, perform the following steps:

1. Connect a Cyclone for ARM devices to the PC via a serial or a USB cable, and make sure that it is powered before launching the Cyclone Configuration Utility. The Cyclone for ARM devices Configuration Utility starts up with the following screen:

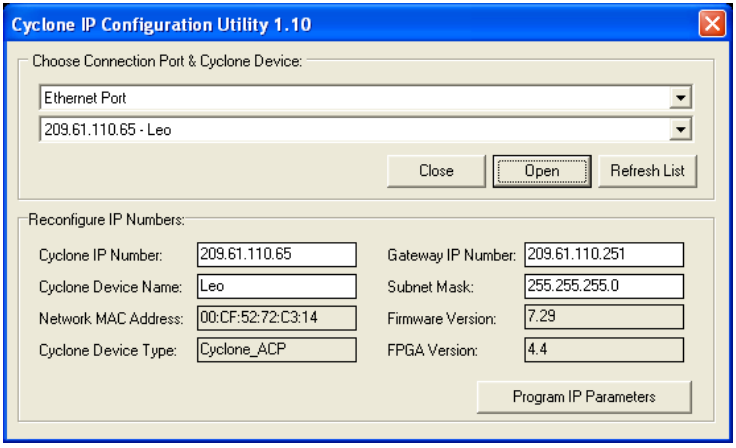

Figure 8-2: Cyclone IP Setup Utility - Initial Screen

2. Assuming that the Cyclone for ARM devices is connected to the COM1 serial port of the PC, switch from “Ethernet Port” to “Serial Port”, at which point the second drop-down box will display COM1. Click “Open” to get a dialog box similar to the following:

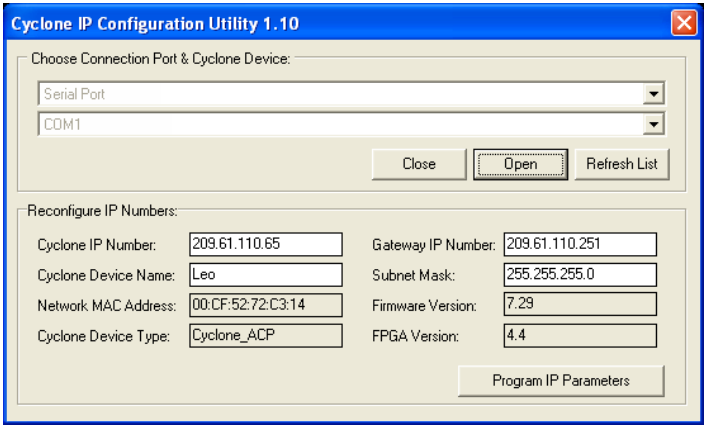

Figure 8-3: Cyclone IP Setup Utility - Continue Setup

3. The Cyclone for ARM devices now needs to be programmed with IP numbers for the network on which it will operate. The Cyclone IP Number field must contain a unique IP number.

9 SERIAL PORT CONFIGURATION

Standard serial cables may be used for serial port Cyclone for ARM devices configuration.

10 USB PORT CONFIGURATION

Standard USB cables may be used for USB port Cyclone for ARM devices configuration.The user may use network hubs as necessary.

11 AUTOMATIC SERIAL NUMBER MECHANISM

When producing a microcontroller- or microprocessor-based product, it is often useful to program a unique serial number into the permanent memory (FLASH) of the product.

P&E has developed a serial number mechanism to automate this process. Each time you issue a serialization command in the programming software, the current serial number is programmed at a specified address. In addition, the serial number is incremented to the next available serial number and saved for future serialized programming operations.

The Cyclone for ARM devices adopts this automatic serial number mechanism for its stand-alone operations.

11.1 Understanding Serialization

The automatic serial number mechanism supports serial numbers from 1 to 16 bytes in length. Each byte of a serial number ranges between a lower and an upper bound. This approach allows the individual bytes of the serial number to have distinct properties. Some of the forms these properties can take are:

Type	Lower Bound (hex)	Upper Bound (hex)
Constant	Constant	Constant
Binary	00	FF
ASCII Printable	20	7E
ASCII Numeric	30	39
ASCII Upper Case Letter	41	5A
ASCII Lower Case Letter	61	7A
Other	XX	YY

Each serial number and its properties are stored in a separate file. Any file name can be used for the serial number file, however the extension .ser is normally appended because it makes it simpler locate the file.

A utility called SERIALIZE has been developed to make it easy to create, visualize, edit, and maintain these serial number files.

11.2 Serialize Utility

This section is a modified excerpt from P&E's Serialize Help File and explains the Serialize utility in detail.

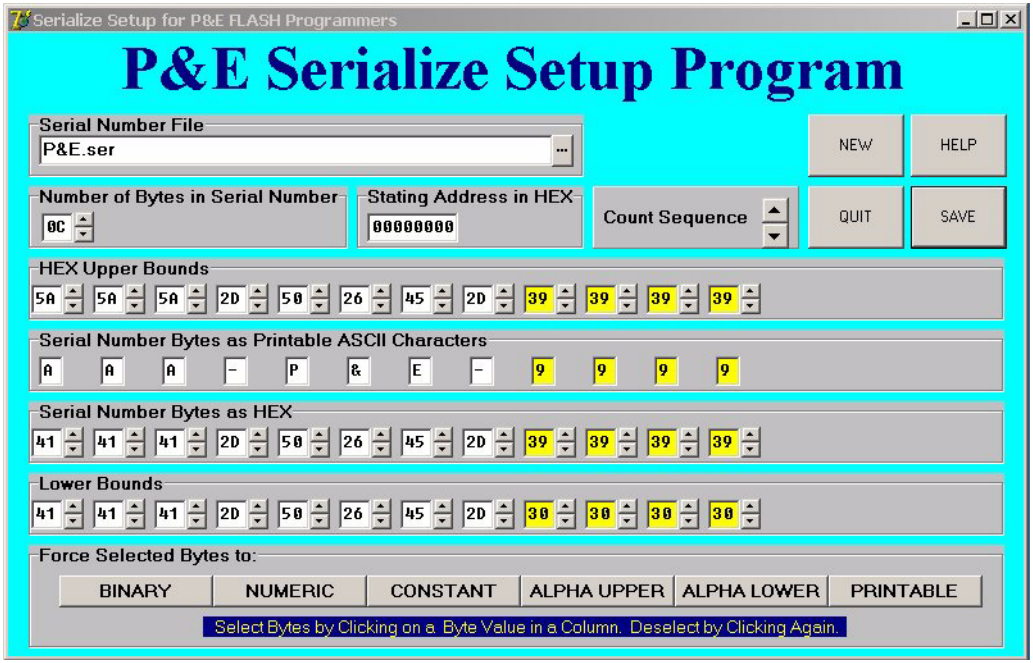
Serialize Setup for P&E FLASH Programmers
P&E Serialize Setup Program
Serial Number File
P&E.ser
NEW
HELP
Number of Bytes in Serial Number
0C
Stating Address in HEX
00000000
Count Sequence
QUIT
SAVE
HEX Upper Bounds
5A 5A 5A 2D 50 26 45 2D 39 39 39 39
Serial Number Bytes as Printable ASCII Characters
A A A - P & E - 9 9 9 9
Serial Number Bytes as HEX
41 41 41 2D 50 26 45 2D 39 39 39 39
Lower Bounds
41 41 41 2D 50 26 45 2D 30 30 30 30
Force Selected Bytes to:
BINARY
NUMERIC
CONSTANT
ALPHA UPPER
ALPHA LOWER
PRINTABLE
Select Bytes by Clicking on a Byte Value in a Column. Deselect by Clicking Again.

Figure 11-4: Serialize Main Screen

11.2.1 Serial Number File

This edit box shows the currently selected Serial Number File, or else indicates "None Selected". If you try to select a nonexistent file, the selection will revert to "None Selected". On startup the edit box, by default, shows the filename that was in effect the last time the QUIT button was clicked. You can select a new Serial Number File in the following ways:

- Single Click - Lets you directly edit the filename in the edit box. Pressing Enter will check for the existence of the file. If not found, the selected file gets set to "None Selected". If the file exists, the serial number and its properties are displayed on screen.
- Double Click or …Click - Opens a standard file browser and lets you

choose from existing files by disk, directory, name, and extension.

11.2.2 Number of Bytes in Serial Number

The up and down arrows let you add or delete bytes for the serial number, max=10 hex (16 base ten), min=1.

- Up Arrow Click - Adds new bytes to the Serial Number. Each byte added appears as a new column in the serial number representation. Added bytes are input as Binary Bytes, i.e. the upper bound is FF and the lower bound is 00.
- Down Arrow Click - Deletes bytes from the right end of the Serial Number. Any previously entered byte properties are lost.

11.2.3 Count Sequence

This window lets you count up or down through the sequencing of the serial number. The serial number is allowed to wrap over the top of the highest serial number or below the lowest serial number. Note that in P&E programmers, the serial number can only count up and any attempt to overflow will cause an error.

- Up Arrow Click - Counts the serial number up.
- Down Arrow Click - Counts the serial number down.

11.2.4 Serial Number Bytes as Hex

There is one display column for each byte in the serial number shown as printable ASCII characters. Non-printable ASCII characters are indicated by the small solid block graphic.

- Up Arrow Click - Counts the serial number up.
- Down Arrow Click - Counts the serial number down.

11.2.5 Hex Upper Bounds

There is one display column for each upper bound of the byte in the serial number in hex.

- Up Arrow Click - Increases the upper bound by one with a maximum of FF Hex.
- Down Arrow Click - Decreases the upper bound by one with a minimum of the current serial number byte value.

- Double Click on Hex - Selects or deselects the byte column. Selected shown in yellow. The serial number byte in this column may then be modified using the buttons at the bottom of the Serialize utility. Please refer to **Section 11.2.11 - BINARY, NUMERIC, CONSTANT, ALPHA UPPER, ALPHA LOWER, and PRINTABLE**.

11.2.6 Hex Lower Bounds

There is one display column for each byte of the lower bound of the serial number in hex.

- Up Arrow Click - Increases the lower bound by one with a maximum of the current serial number byte value.
- Down Arrow Click - Decreases the lower bound by one with a minimum of 00 Hex.

11.2.7 NEW

Instructs the program to start editing a NEW (as yet un-named) serial number file. It will throw away the information for any serial number currently being edited unless that information has been saved (Save Button). The new serial number is initialized with one (1) byte of binary.

11.2.8 SAVE

Instructs the program to save the current serial number being edited into the file name and path shown in the Serial Number File window. If a file name has not been provided, i.e. the window shows None Selected, then an error is displayed in a red window on the screen. If this happens, type in a filename in the window and click Save again.

11.2.9 HELP

Opens the Serialize help system (serialize.hlp file, i.e. this file) for perusal.

11.2.10 QUIT

Turns off the Serialize Program and saves any setup information in the file Serialize.ini. This file will initialize the setup information the next time the program is started. Xing out of the program (top right of screen) does not save the setup info.

11.2.11 BINARY, NUMERIC, CONSTANT, ALPHA UPPER, ALPHA LOWER, and

PRINTABLE

These buttons are used to set the properties of selected (colored yellow) bytes of the Serial Number. Individual bytes whose properties you wish to modify are selected or deselected by double-clicking in the Hex Upper Bounds box in the column that corresponds with the values for a particular byte.

11.3 Serialize Utility Example

This example shows:

1. Currently editing file C:\Example.ser
2. Number of bytes in the serial number is 10 Hex (= 16 base ten)
3. Starting address is 0000000 Hex
4. Next Serial number is AAA-P&E-9999 in ASCII
   a. First 3 bytes are Upper Case Alphabetic ASCII (AAA)
   b. Next 5 bytes are Constants (-P&E-)
   c. Last 4 bytes are Numeric ASCII (9999)
5. This provides for a maximum of 6,760,000 (26x26x26x10x10x10x10) serial numbers from AAA-P&E-0000 to ZZZ-P&E-9999.
6. The last 4 bytes of the serial number are selected (colored yellow) so that their properties can be changed using the forced selected byte buttons on the bottom of the screen.

11.4 Using Serial Number File

The command to invoke the serial number file in P&E's interactive programming software is "CS Choose Serial File". The command to actually program the serial number to target and automatically increment the serial number afterward is "PS Program Serial Number".

P&E's command line software uses the same commands in a command line fashion to invoke the serial number file, initiate its programming, and increment:

```
CS serial_number_file.ser
PS
```

11.5 Serial Number Handling in Cyclone for ARM devices

The Cyclone for ARM devices' firmware implements the automatic serial number mechanism. The same serial number files are used with the Cyclone Image Creation Utility, and the same commands are used to specify the serial number file and initiate serial number programming and incrementation. The serial number data structure is saved in the SAP image. Once a "PS" command is carried out, a serial number is programmed into the target. Only after all operations have been completed successfully does the Cyclone for ARM devices firmware automatically increment the serial number and store it in the Cyclone for ARM devices' flash for internal images (or external CompactFlash for external SAP images).

The CS and PS commands are not present in the Cyclone Image Creation Utility until a valid programming algorithm is specified.

To complement the Cyclone's usage in production environments, the Cyclone for ARM devices supports multiple serial number structures for each programming algorithm block. Each SAP image may contain multiple programming algorithms for every memory module it needs to program, and each programming algorithm block may contain multiple serial number structures. The SAP image sequence below illustrates this briefly:

CM algorithm_file_1
SS object_code_1
EM
PM
VC
CS serial_file1.ser
PS
CS serial_file2.ser
PS
CS serial_file_3.ser
PS
CM algorithm_file_2
SS object_code_2
EM

PM
VC
CS serial_file4.ser
PS
CS serial_file5.ser
PS

12 CYCLONE ERROR CODES

The Cyclone will indicate errors using the following codes. Please contact P&E if you are unsure of the specific meaning of an error code.

12.1 Debug Mode Communication Errors

$0001: No target response

$0002: Invalid target response

$0003: Wait for target response canceled

$0004: Wait for target response failed

$0005: Error detecting communication speed

$0006: Failed to unsecure target

$0007: Error entering debug mode

$0008: Error entering debug mode while target is secured

$0009: Error entering debug mode for verification

$000A: Error writing a block of data to target

$000B: Error enabling or disabling module

$000C: Error in performing timing test

$000D: MON08 target had an invalid reset

12.2 SAP Image Handling Errors

$0011: SAP image ID is greater than total number of images

$0012: Error during SAP image validation

$0013: SAP operation was not configured

$0014: SAP image storage was not initialized

$0015: SAP image transfer error, invalid data length

$0016: SAP image transfer error, invalid start address

$0017: SAP image transfer error while writing to storage

$0018: Error writing serial number structure storage

$0019: Error writing LCD menu structure storage

$001A: Error erasing storage block

$001B: SAP image requires higher firmware version

$001C: SAP image version not supported

12.3 SAP Communication Handling Errors

$0031: System reset occurred (out of reset for host-controlled operations)

12.4 SAP Algorithm Header Operation Handling Errors

$0061: Undefined algorithm header operation, check software and firmware versions

$0062: Algorithm header operation failure, check software and firmware versions

12.5 SAP Operation Errors

$0081: SAP operation is not supported, check software and firmware versions

$0082: SAP operation error, SAP image contains different target type

$0083: SAP operation cancelled

12.6 SAP Blank Check Range and Module Errors

$1001: Blank check error, algorithm not supported

$1002: Blank check error, algorithm not found

$1003: Blank check operation failed

12.7 SAP Erase Range and Module Errors

$2001: Erase error, algorithm not supported

$2002: Erase error, algorithm not found

$2003: Erase error, module failed or canceled

$2004: Erase error, module failed, target is still secured

$2005: Erase error, module not performed, data is preserved

12.8 SAP Program Byte, Word, and Module Errors

$3001: Programming algorithm is not supported

$3002: Programming algorithm was not found

$3003: Program operation failed or canceled

$3004: Program operation failed, write protected

$3005: Program operation failed, nonblocking data size exceeds limit

$300A: Error during reading data block, invalid data length

$300B: Error during reading data block, invalid start address

$300C: Error during reading data block, no target power

$300D: Error during programming data block, invalid data length

$300E: Error during programming data block, invalid start address

$300F: Error during programming data block, no target power

$3040: (MSD, Kinetis only) Error during programming, would cause device to become permanently secured

12.9 SAP Verify Checksum Errors

$4001: VC command not supported

$4002: VC failed, invalid algorithm

$4003: VC operation failed or canceled

$4011: VV command not supported

$4012: VV failed, invalid algorithm

$4013: VV operation failed or canceled

12.10 SAP Verify Range and Module Errors

$5003: Verification operation failed or canceled

12.11 SAP User Function Errors

$6003: User function failed or canceled

12.12 SAP Trim Errors

$7001: Trim operation not supported

$7003: No target response
$7004: Trim write error, trim value not set
$7007: Trim write error, trim value failed
$7008: Trim read error, trim value failed
$7009: Trim value invalid, value is blank or zero
$700A: Trim value already programmed

12.13 Unrecoverable Fatal Errors

$8001: Fatal Error, please contact P&E
$8002: Fatal Error, please contact P&E
$8003: Fatal Error, please contact P&E
$8004: Fatal Error, please contact P&E
$8005: Fatal Error, please contact P&E
$8006: Fatal Error, please contact P&E
$8007: Fatal Error, please contact P&E
$8008: Fatal Error, please contact P&E
$8009: Fatal Error, please contact P&E
$800A: Fatal Error, please contact P&E
$800B: Fatal Error, please contact P&E
$800C: Fatal Error, please contact P&E
$800D: Fatal Error, please contact P&E
$800E: Fatal Error, please contact P&E
$800F: Fatal Error, please contact P&E
$8010: Fatal Error, please contact P&E
$8011: Fatal Error, please contact P&E
$8012: Fatal Error, please contact P&E
$8013: Fatal Error, please contact P&E
$8014: Fatal Error, please contact P&E
$8015: Fatal Error, please contact P&E
$8016: Fatal Error, please contact P&E

$8017: Fatal Error, please contact P&E
$8018: Fatal Error, please contact P&E
$8019: Fatal Error, please contact P&E
$801A: Fatal Error, please contact P&E
$8020: Fatal Error, please contact P&E
$8021: Fatal Error, please contact P&E
$8022: Fatal Error, please contact P&E
$8023: Fatal Error, please contact P&E

12.14 External Memory Errors

$A001: Error writing to external memory
$A002: Error formatting the external memory
$A003: External memory was disconnected during use
$A004: External memory has unsupported format
$A005: External memory has corrupted data
$A006: External memory disk error
$A007: Failed during internal image verification
$A008: Failed during external image verification
$A009: Error while reading external memory for image pointer

12.15 Serial Number Errors

$B001: Error erasing serial number storage
$B002: Error writing serial number
$B003: Total number of Serial Number Structures is over limit of 254.
$B004: Error converting serial number structure
$B005: Error updating serial number
$B006: Serial number structure not found
$B007: Serial number structure invalid
$B008: Error programming serial number to target

12.16 Successful Download Counter Errors

$C001: Error erasing download counter storage

$C002: Error writing download counter

$C003: Total number of download counter is over limit of 254.

$C004: Error converting download counter structure

12.17 System Hardware/Firmware/Logic Recoverable Errors

$D001: Firmware does not exist

$D002: Firmware update not allowed

$D003: Firmware update failed

$D004: Firmware update mismatch